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DRAFT

WORK PLAN
FOR
REMEDIAL DESIGN FOR ALLEN HARBOR LANDFILL
AT
NAVAL CONSTRUCTION BATTALION CENTER (NCBC)
DAVISVILLE, RHODE ISLAND

Contract No. N62472-92-D-1296
Contract Task Order No. 0003

Prepared for:

Department of the Navy
Northern Division
Naval Facilities Engineering Command
10 Industrial Highway
Mail Stop No. 82
Lester, Pennsylvania 19113-2090

Prepared by:

EA Engineering, Science, and Technology
15 Loveton Circle
Sparks, Maryland 21152
(410) 771-4950

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11 November 1993
DRAFT
EA Project No. 296.0003
Task 4100

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1. PROJECT DESCRIPTION

1.1 INTRODUCTION AND OBJECTIVES

Under the Base Realignment and Closure (BRAC) multi-year Comprehensive Long-Term Environmental Action (CLEAN) Contract (Contract No. N62472-92-D-1296) Northern Division, Naval Facilities Engineering Command, issued Contract Task Order (CTO) No. 0003 for the remedial design at Allen Harbor Landfill at the Naval Construction Battalion Center (NCBC) Davisville, Rhode Island, to EA Engineering, Science, and Technology. NCBC Davisville has been identified for base closure, currently scheduled for spring 1994. As part of the overall NCBC Davisville Installation Restoration (IR) Program, the Allen Harbor Landfill has been designated as Site 09. EA is being requested to produce the remedial design, as generally specified by the Statement of Architect-Engineer Services dated 6 July 1993 (Appendix A). EA responded with an Implementation Plan (dated 30 August 1993) which formed the basis for contract negotiations between Northern Division and EA, and which generally described EA's approach to the project.

The general objectives of the project are to provide for the design of a landfill containment system and a ground-water extraction and treatment system. The containment system is to consist of a landfill cap and a sub-surface hydraulic barrier (e.g., slurry wall, sheet piling, etc.). The ground-water extraction system is to provide for removal of site ground water through a system of extraction wells, transport via a manifolded pipeline, and treatment of the ground water at a new treatment plant to be designed under this CTO. Treatment may consist of metals removal via chemical precipitation or microfiltration, and chlorinated organics removal via UV oxidation. It is anticipated that the discharge from the treatment system will be to surface water or reinjected.

1.2 SITE DESCRIPTION

The Allen Harbor Landfill consists of approximately 15 acres located on the western side of Allen Harbor. From 1946 to 1972, the site was used as a landfill for waste generated at NCBC Davisville and the former NAS Quoset Point. Reportedly, a variety of wastes, including preservatives, paint thinners, degreasers, polychlorinated biphenyls (PCB), asbestos, ash, sewage sludge, and contaminated fuel oil were disposed in the landfill, usually

by burning and then covering. The site is presently covered with a final soil layer of varying depth and is significantly overgrown with tall grasses, scrub, and trees.

Studies conducted at the site by TRC Environmental Consultants, Inc. (TRC) have included sampling of surface and subsurface soil, sediment, leachate seeps, and ground water. Compounds and analytes detected in both soil/sediment and ground-water/seep samples include volatile organic compounds (VOC), semivolatile organic compounds (SVOC), PCB, and metals. TRC estimated current and future carcinogenic risks due to exposure to site surface soil range from 3.13×10^{-5} to 3.45×10^{-4} based on worst case exposure scenarios, with polycyclic aromatic hydrocarbons (PAH), PCB, arsenic, and beryllium driving the risk values. Worst-case ground-water ingestion cancer risks were estimated on the order of 1.79×10^{-3}, with vinyl chloride, arsenic, and beryllium contributing the most to this total risk value. Worst-case subsurface soil exposure risks estimated for excavation/utility workers were on the order of 7.82×10^{-6}, with PAH driving the risk value. Non-cancer risk estimates for exposure to surface soil were estimated to be below the acceptable limit except for the future residential use, worst-case, childhood soil ingestion scenario, with chromium, nickel, and zinc contributing most to this risk. An increased probability of adverse chronic effects for the most-probable ground-water exposure scenario is a potential concern. The greatest concern would be exposure to antimony, cadmium, and manganese in the ground water.

2. PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 KEY PERSONNEL

Figure 2-1 shows the Project Organization for executing this CTO. Following are summaries of pertinent qualifications of the key personnel for this CTO.

CTO Manager—Mr. Peter Pellissier, P.E.

Mr. Pellissier is a registered Professional Engineer (PE) with more than 11 years of experience in engineering and 5 years of experience in managing DOD remedial projects.

Mr. Pellissier has a well-developed experience base of managing solid waste management, site closures, and hazardous waste remediation design projects for both federal government and industrial clients. He served as project manager for five PCB remediation projects at NSPCC Mechanicsburg, Pennsylvania, and for two UST removal/replacement projects at NAS Brunswick, Maine. Mr. Pellissier is well-versed in the preparation of plans and specifications for construction to the Navy's criteria.

In addition to project management experience, Mr. Pellissier has also performed site inspections, feasibility studies, detailed design calculations, and generated many construction cost estimates.

Project Engineer—Mr. Peter W. Kotulak, P.E.

Mr. Kotulak is a Professional Engineer with more than 9 years experience in environmental consulting. He has a technical background in civil engineering, biology and chemistry. He has participated in numerous remedial design projects for the government, including NSPCC Mechanicsburg, Pennsylvania; Superfund sites for the U.S. Army Corps of Engineers (Omaha and Baltimore Districts); DERA investigations of abandoned NIKE missile sites; and closure plans for U.S. Air Force sites. He has also participated in remedial investigations and feasibility studies for hazardous waste remediation associated with these government agencies, and has provided construction oversight to ensure successful completion of these projects.

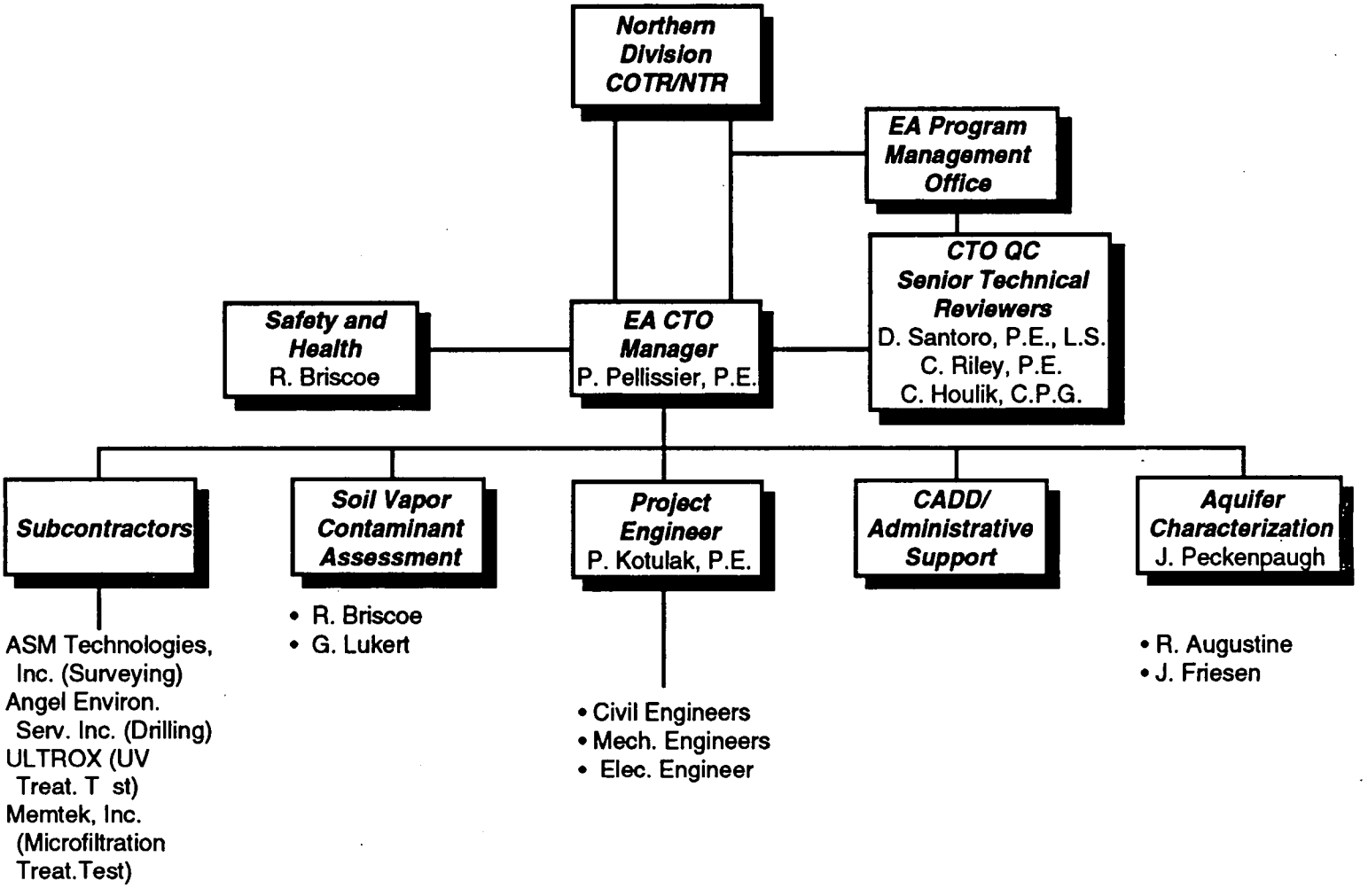

Figure 2-1. CTO Organization.

In addition to government-related work, Mr. Kotulak has participated in private-sector remedial investigations, feasibility studies, remedial design and construction oversight for numerous hazardous waste remediation.

Senior Technical Reviewer (General Engineering)—Mr. David Santoro, P.E., L.S.

Mr. Santoro is EA's Chief Engineer responsible for Quality Control and Senior Technical Review for civil, environmental, and process-related projects. He has participated as Chief Engineer or Principal-in-Charge for more than 100 Phase I and Phase II Superfund investigations; four major state-funded Superfund projects; a number of remedial investigations/feasibility studies (RI/FS) for Corps of Engineers/EPA; more than 80 subsurface petroleum assessment projects; more than 30 remedial designs for UST projects; DERA investigations of abandoned NIKE missile sites; remedial designs for the Omaha District; remedial designs for NSPCC Mechanicsburg; design permitting and operations assistance for solid waste management facilities; leachate handling and treatment systems; technical review of designs and reports by others; and monitoring activities. Projects which have been completed for federal entities include: U.S. Air Force, Corps of Engineers, U.S. Navy, NIH, and a variety of industrial, public, and private clients.

Senior Technical Reviewer (Ground-Water Treatment)—Mr. Christopher Riley, P.E.

Mr. Riley is Manager, Design Services of EA's Waste Management Business. In this capacity, he serves in senior technical and management roles on a broad range of activities including feasibility studies, engineering designs, and remedial action projects. Over the past 20 years, he has completed more than 100 design projects that have been related to all phases of engineering from conceptual definition through system operation and maintenance. He has served as consultant on more than 20 ground water/leachate treatment projects and has been the principal designer for five ground water/leachate treatment projects, including process design, detailed engineering specification, permitting, construction observation, and startup. Contaminants have included dissolved inorganic and organic chemical and floating and dense free phase hydrocarbons. Inorganic chemical treatment has involved metals removed by pH adjustment, iron removal by aeration, and solids separation by several filtration techniques. Organic treatments has involved air stripping, liquid and vapor phase carbon adsorption. Hydrocarbon recovery has involved free phase pumping and oil/water separation including a preliminary design for recovery of residual free phase using *in-situ* gas sparging.

Program Manager/Senior Technical Reviewer (Geology)—Dr. Charles Houlik, CPG

Dr. Houlik has more than 20 years of experience in the performance and management of multidisciplinary investigations addressing environmental issues and/or in support of engineering design. He is a Certified Professional Geologist with extensive experience in waste management, contaminant assessment, impact assessment, environmental remediation, and facilities siting. His responsibilities include active participation in, and supervision of, site and regional geological investigations, surface and ground-water hydrological evaluations for siting or design of facilities, impact assessments for existing and proposed facilities, RI/FS, and remedial design. Dr. Houlik has senior responsibility for geological services at EA.

2.2 QUALITY CONTROL

EA's primary means of building in quality at the inception of each project is through the use of the quality program EA has established for project planning and deliverables. EA's quality control program that applies to CTOs is fully described in the Program Quality Management Plan for the BRAC/CLEAN Program.

The Senior Technical Reviewers, CTO Manager, and Program Manager will approve the various deliverables as shown in Table 2-1. This process will involve review of deliverables against the CTO and approved Implementation Plan. This review will be done by experienced personnel independent of the day-to-day project work.

PROJECT DELIVERABLES SCHEDULE
TABLE 2-1

NAVY ACTIVITY: NCBC Davisville

PROJECT NAME: Remediation of Allen Harbor Landfill

PROJECT NO: 296.0003

PROJECT DESCRIPTION: Landfill Cap, Ground-Water Extraction and Treatment System, Hydraulic Containment Barrier

CTO MANAGER: Pete Pellissier

PROJECT LOCATION: Davisville, RI

DATE PREPARED: 8/13/93

DATE REVISED: 10/14/93 Revision 2

DATE IMPLEMENTATION PLAN APPROVED BY NAVY: 9/10/93

TYPE OF DELIVERABLE	Date To Reviewers	Client Due Date	REVIEW/SIGN OFF (ID BY NAME)				
			CTOM*	STR*	PM*	AM	OTHER
Preliminary Draft Design Work Plan	10/15/93	10/22/93	Pellissier	Santoro Houlik	Houlik		
Draft Design Work Plan	11/11/93	11/18/93	Pellissier	Santoro Houlik	Houlik		
Final Design Work Plan	12/23/93	12/30/93	Pellissier	Santoro Houlik	Houlik		
Design Development Submission	1/14/94	1/28/94	Pellissier	Santoro Houlik Riley	Houlik		
Final Submission	4/08/94	4/22/94	Pellissier	Santoro Riley	Houlik		
Bidding Documents Submission	5/20/94	5/27/94	Pellissier				

* Signoff by this individual required.

PROGRAM MANAGER APPROVED: CLH

DATE: 11-10-93

CTOM - CONTRACT TASK ORDER MANAGER
PM - PROGRAM MANAGER
AM - ACTIVITY MANAGER
STR - SENIOR TECHNICAL REVIEWER: Houlik-geologic; Santoro-general engineering; Riley-ground-water treatment

3. SCOPE AND TECHNICAL APPROACH

3.1 PRE-DESIGN TASKS

The following work items are necessary to compile the information required for the remedial design to progress.

3.1.1 Aerial Survey

In order to provide an up-to-date topographic map of the Allen Harbor Landfill, EA will provide for a survey of the site. This information is essential for the design of a closure system as it provides existing grades and will identify the site boundaries, state coordinate system, and other site features. EA's experience with aerial surveys has indicated that a second aerial photograph showing the site and surrounding features is valuable for illustrative purposes during both technical and public meetings. We are recommending that this photograph be taken. The aerial survey and photogrammetry task will be performed by ASM Technologies, Inc. as a subcontractor to EA.

3.1.1.1 Scope Basis

- Aerial survey to be flown in November 1993 (after the leaves have dropped).
- ASM Technologies, Inc. to work with EA and NCBC Davisville staff in a records search to obtain horizontal and vertical control on the site.
- Site boundaries will be based on information provided to EA by TRC or NCBC-Davisville.
- Rhode Island state coordinate grid system to be utilized.
- Vertical datum will be the NGVD of 1929.
- One-ft contour interval, 1 in. = 60 ft scale.

- AutoCad (Release 11) diskette to be provided by ASM Technologies, Inc. to EA.

- Projected staffing: CTO Manager, Project Engineer, CADD Operator, Clerical Support.

- An additional two 2-day trips will be made by the surveying subcontractor to survey locations of the utility routing and treatment building locating coordinates.

3.1.1.2 Deliverables

Mapping will be part of the design development and subsequent submittal.

3.1.2 Soil Vapor Contamination Assessment (SVCA)

EA will perform an SVCA of the Allen Harbor Landfill site to evaluate the nature, extent, and relative concentrations of landfill gases. This information will be used in the design of a landfill gas management system. Depending upon the results of the SVCA and state regulations, the gas management system may be either an active gas extraction or a passive gas venting system. EA will use its mobile laboratory to conduct the SVCA.

Adequate soil vapor samples may not always be obtainable. A tight soil matrix, shallow or perched ground water, or subsurface obstruction can prevent vapors from entering the sampling system. At each location where there is sampling difficulty, two additional attempts will be made before proceeding to the next location. If a sample is not obtainable at the location, the cause of difficulty will be documented on the SVCA field data sheets which are to be included in the design development submission design analysis report.

Approximately 65 soil gas sampling locations (Figure 3-1) will be selected based on a 100-ft grid. The grid will use Sanford Road as a baseline and individual points will be measured and located in the field. Any sampling points that are not accessible will be adjusted to the nearest accessible point. The adjustment will be noted for the record. Samples will be collected at depths of 3 to 5 ft, as shallow ground water is expected to prevent sampling at greater depths. The SVCA sampling effort is expected to be completed at 5 days.

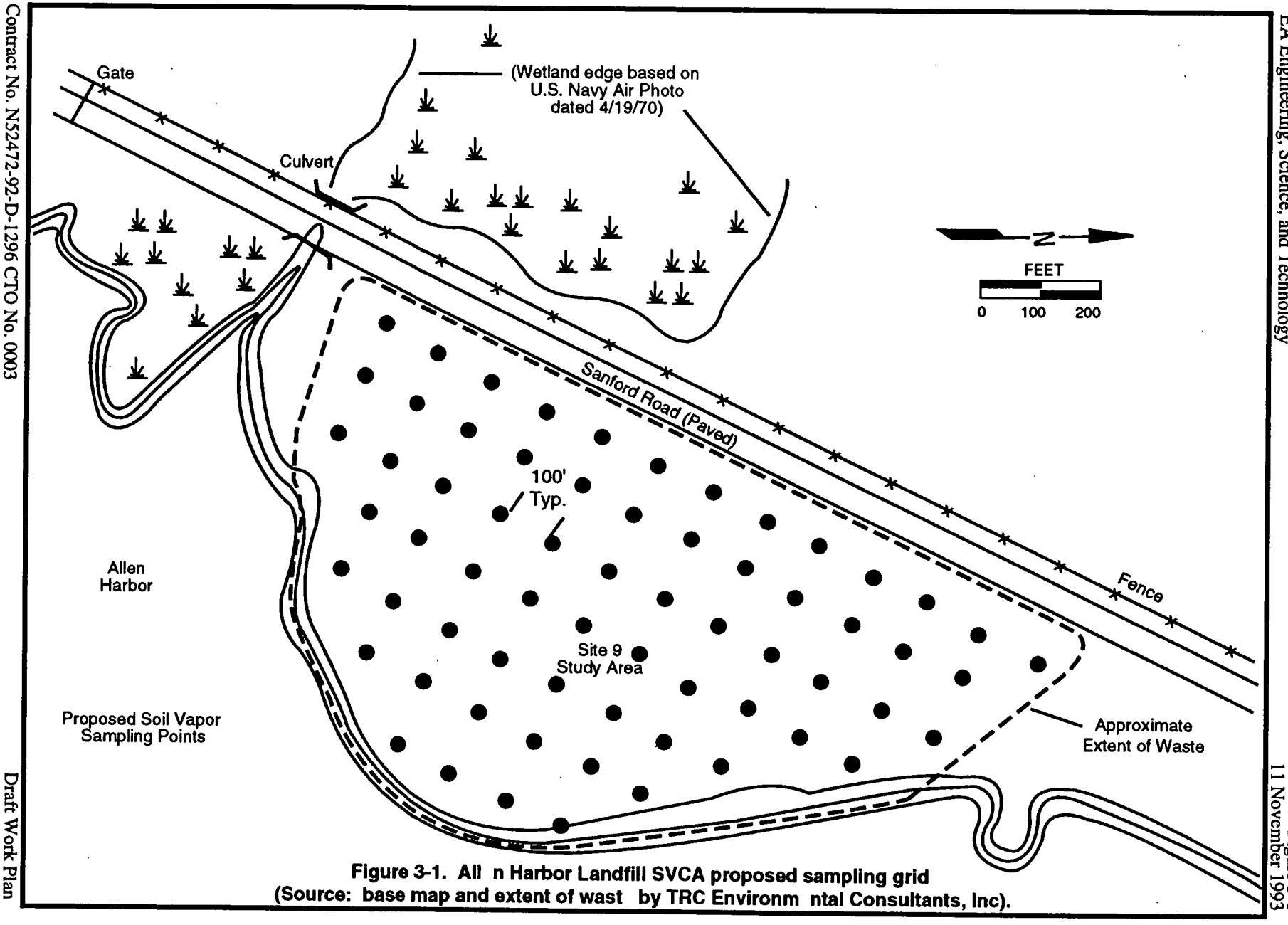

Figure 3-1. All n Harbor Landfill SVCA proposed sampling grid (Source: base map and extent of wast by TRC Environm ntal Consultants, Inc).

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Revision: DRAFT
Figure 3-1
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3.1.2.1 SVCA Sampling Protocols

Upon arriving at the site, a 100-ft grid will be established using a tape and visual sightings. Following the selection of the soil vapor sampling locations, small diameter, hollow steel probes containing a screened interval at the lower end, will be driven to a depth of 3 to 8 ft. The actual sampling depth obtained will be dependent upon the depth to ground water or subsurface obstruction. This information will be recorded on the sample results table. After the probe is driven to the appropriate depth, a sampler head consisting of a vacuum gauge, vacuum port, and sampling port will be attached to the distal end of the probe. A schematic of the sampling apparatus is shown in Figure 3-2. A vacuum source will be applied and the system will be pumped for approximately 1 to 2 minutes. During pumping, soil resistance to vapor flow will be measured via the in-line vacuum gauge. The vacuum gauge indicates if vapors are entering the probe from the subsurface. If the vacuum gauge shows essentially no reduction in pressure after the vacuum pump is activated, vapors are being readily obtained and the system requires approximately 1 minute of purging to remove a volume exceeding the sampler and probe volume. If a significant reduction of pressure is observed (e.g., 15-in. Hg vacuum), but the pressure returns to atmospheric fairly quickly, a longer pumping time of 2 to 3 minutes would be adequate. If the pressure does not noticeably increase over 30 seconds, soil vapor is not adequately entering the probe and the sampling apparatus. In that case, a sample is not taken and the reasoning documented. At the Allen Harbor site, at each point where sampling difficulty is encountered, two additional probes will be installed prior to aborting sampling at that location.

SVCA probes will be decontaminated between uses. Excess dirt will first be removed using a wire brush. Probes will then be washed with a laboratory grade cleaning solution and rinsed with deionized water.

Clean, gas-tight syringes used to collect vapor samples from the sampling apparatus. Compound-specific identification and qualification will be performed using onsite gas chromatography (GC).

Vapor samples will be analyzed onsite for VOC by means of an HNU 421 GC and a Photovac 10S70 GC, each equipped with integrators and the following detectors:

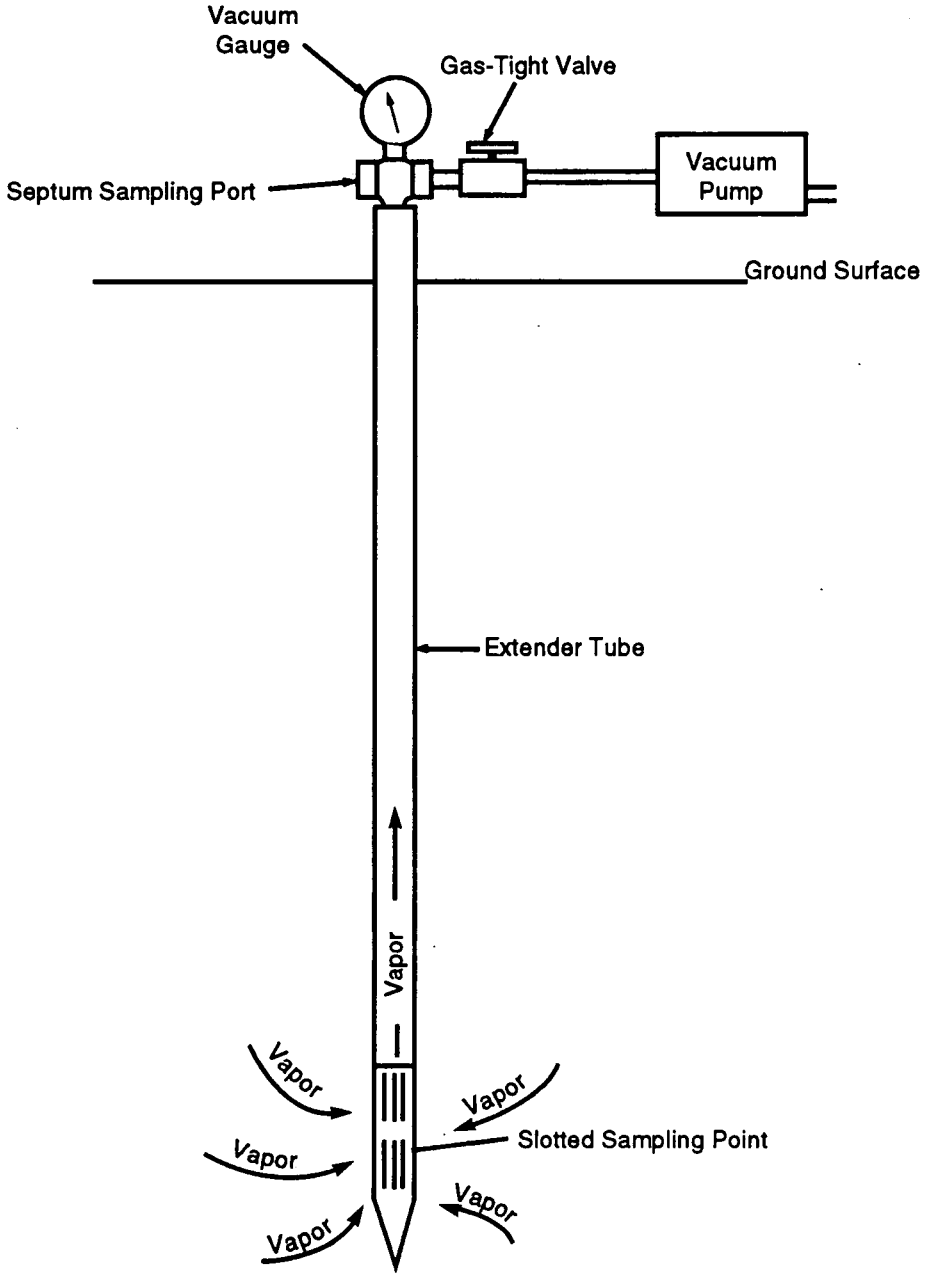

Figure 3-2. Schematic of soil vapor sampling apparatus.

- Flame Ionization Detector (FID): for the analysis of volatile hydrocarbons. The FID will be calibrated with methane, a common landfill gas.

- Electron Capture Detector (ECD): for the analysis of volatile halogenated compounds, such as the chlorinated solvents. The ECD will be calibrated with methylene chloride, cis-1,2-dichloroethene, trichloroethane (TCA), carbon tetrachloride, trichloroethene, and tetrachloroethylene. These compounds are commonly used solvents.

- Photoionization Detector (PID): for the analysis of volatile hydrocarbons and aromatics. The PID will be calibrated with benzene, toluene, ethylbenzene, and o-xylene (BTEX). BTEX are used as indicators of the presence of petroleum products.

Soil vapor samples tend to contain many compounds. When a sample is injected into the GC, compounds are first separated by an appropriate analytical column. As the separated compounds elute from the GC column, they enter the detector and create a signal. The signal is then amplified, integrated, and reported as a chromatographic peak.

Concurrent with compounds eluting from the GC column, the integrator prints out a chromatogram, which is a continuous graph of GC detector response to the eluting compounds. Subsequently, a numerical summary of peak areas is printed.

The GC systems will be calibrated by injecting a known amount of vapor standard containing the compounds of interest onto each column. Compound retention time and response data are stored in the integrators, and subsequently used to identify and quantify the selected compounds in the samples. Essentially, a calibrated analyte (e.g., benzene) has a known retention time and known GC response. Therefore, the corresponding chromatogram peak for a sample run can be identified by retention time and quantified by comparison to the calibration response. The detection limit for each compound of interest will be at or below 1 ppm. Specific detection limits will be established in the field at the time of analysis.

For quality control, calibration standards will be run each day prior to analysis, and every 4 to 5 hours thereafter. A minimum of one sample will be analyzed in duplicate per day.

The sampling apparatus will be cleaned between uses to remove residual compounds. Probe blanks will also be analyzed each day to ensure the sampling system is free of extraneous contamination. Data reduction will be accomplished by a qualified chemist and the data will be QC reviewed by a second qualified chemist.

3.1.2.2 Scope Basis

- Equipment will be decontaminated between each sampling point.
- One week field time to perform SVCA.
- One week office time for data interpretation and reporting.
- One day travel time to site and one day to return.
- Analysis will be for methane and other VOC gases.
- The sampling points located approximately 100 ft on center.
- No site access problems.
- Projected staffing: Senior Technical Review, Environmental Chemist, Technician, CTO Manager, and Clerical Support.

3.1.2.3 Deliverables

The results of the SVCA and the impact on design activities will be part of the design development submission.

3.1.3 Aquifer Testing

In order to obtain information for the design of the ground-water extraction and treatment system, EA will perform aquifer characterization activities at the site. These activities will include a 72-hour ground-water level and tide level monitoring program. EA will use existing wells for the water-level monitoring program.

Selection of wells to monitor in the water-level monitoring program will be based upon information provided to EA by TRC, who installed 19 monitoring wells at the site in 1993. EA will evaluate the TRC monitoring well information (depth, construction, areal spacing, ground-water levels, ground-water chemistry, etc.) to evaluate which of the wells are the best candidates for ground-water level monitoring.

The specific conductance of the ground water will also be monitored automatically at two nested wells, one shallow well within the landfill and one deep well below the landfill. The specific conductance of the remaining wells will be periodically measured during the 72-hour monitoring program.

3.1.3.1 Data Usage

Thirteen monitoring wells and one tide site at the Allen Harbor Landfill will have their water levels automatically recorded for a 72-hour period. These wells and six additional wells will have their water levels periodically measured during the 72-hour monitoring program. Data collected from the monitoring program will be used to compute the aquifer's hydraulic conductivity and specific yield or storage. Specific uses of data include the development of:

- Water table and potentiometric surface configuration maps and, to the extent possible given the available database for the site aquifer, analyte isopleths.

- Calculations of ground-water-flow rates based on the computed hydraulic conductivity and observed hydraulic gradients.

- An evaluation of surficial drainage characteristics of the immediate areas of the landfill as a contributing factor in and/or as a transport mechanism for potential ground water or surface water contamination originating from the landfill.

- A description of regional and local ground-water-flow regimes, including a conceptual model of the hydrogeologic conditions. This model will include the interaction of the aquifer with surface water bodies as appropriate.

3.1.3.2 Location and Frequency of Investigations

Ground-water level and tide level monitoring will include a 72-hour period of automatic measurements on thirteen monitoring wells and one tide level site.

3.1.3.3 Equipment and Procedures

Ground-water levels will be measured approximately every 5 minutes used pressure transducers whose readings are stored in data loggers. The tide levels are also measured every 5 minutes by an automatic water level recorder equipped with a pressure transducer, which also compensates for any changes in the atmospheric pressure. Specific conductance and water temperature will be measured on 5-minute intervals. Ground-water levels and specific conductance of the ground water will also be measured periodically using electronic water-level indicators and a specific conductivity meter, respectively.

Materials and equipment required for this activity will include:

- Data loggers
- Pressure transducers
- Tide gauge
- Conductivity/temperature probes
- Barometer
- Rain gauge
- Auxiliary equipment and support vehicle

3.1.3.4 Scope Basis

- One week (5-8 hour days) of field time for two people.

- Thirteen existing wells to have their ground-water levels monitored for a 72-hour period.

- Two existing wells to have their specific conductance monitored for a 72-hour period.

- One tide gauge site to monitor tidal elevations for a 72-hour period.
- Five days of office time for a geologist to interpret data and provide narrative report.
- Existing well construction diagrams will be provided to EA by TRC.
- EA field personnel in Level D PPE.
- Projected staffing: Senior Technical Review, CTO Manager, Geologist, Technician, and Clerical Support.
- No adverse weather delays.

3.1.3.5 Deliverables

The results of the aquifer characterization testing program will be part of the design development submission.

3.1.4 Ground-Water Modeling

Modeling of this site aquifer system will be performed to assess the well placement that would be most advantageous for ground-water extraction. This effort will graphically illustrate the existing ground-water flow net, the cones of influence for various extraction well arrangements in plan view, and a drawdown section diagram for a typical extraction well. The modeling effort will be based on data from the aquifer testing program and existing additional studies (done by others) which attempt to describe and quantify the tidal influence and upgradient recharge at the site. The modeling scenarios will be run for both an uncapped landfill and a RCRA-capped landfill.

Aquifer constants such as transmissivity, storage coefficient, hydraulic conductivity, leakance, and the directional transmissivity axis, will be evaluated. These parameters, along with regional potentiometric head distribution, will be used to simulate capture zones for extraction wells and to identify optimum well spacing. A ground-water-flow simulation

model (e.g., 3-D Mod-Flow or RESSQ) will be used to establish which will utilize the most efficient number of wells to capture the VOC plume. The program, documentation, and data from the final model runs will be provided with the design development submission.

Once ground-water-flow fields are interpreted, a sensitivity analysis will be performed to identify which variables have the most impact on model results. Results of the computer simulation, which will be used to select well spacing, dewatering characteristics of the fill, and the long-term effectiveness in terms of hydraulic control and plume capture of the ground-water treatment system, will be used in the design of the ground-water extraction and treatment system.

3.1.4.1 Scope Basis

- Existing information (studies, reports, etc.) produced by others to be provided to EA by Northern Division.
- Five days to examine and interpret existing site information.
- Two weeks (10 days) to perform the initial modeling effort.
- Five days for data interpretation, figure generation, and reporting.
- Modeling performed for both a capped and uncapped landfill scenario.
- Three days to address design development submission review comments.
- Proposed staffing: Senior Technical Review, CTO Manager, Hydrogeologist, Civil Engineer, and Clerical Support.

3.1.4.2 Deliverables

Results of the ground-water modeling will be provided as part of the design development submission.

3.1.5 Ground-Water Treatability Testing

As per direction from Northern Division, EA will conduct separate treatability testing for the following ground-water treatment technologies: microfiltration, UV oxidation, and chemical precipitation. Quantities of ground water necessary to conduct these bench scale tests will be collected by EA during the SVCA. Analytical testing will include pre- and post-treatment analysis for the Target Compound List (TCL) and Target Analyte List (TAL); methods shall conform to EPA CLP protocols. Treatability tests will be repeated several times under different conditions to identify the optimal treatment arrangements for each technology. The treatability tests will be performed not only to assess the removal efficiencies on the analytes of concern but, in the cases of microfiltration and UV oxidation, to provide information on the potential operational impact of other compounds such as iron and manganese. Two of the treatability tests will be performed by subcontractor laboratories: the UV oxidation testing will be conducted by Ultrox Corporation and the microfiltration testing will be done by Memtek Corporation. Detailed work scopes for the microfiltration and UV oxidation treatability studies are included as Appendix C. EA will perform the chemical precipitation test with in-house resources. Based on the results of the testing, EA will select and recommend to Northern Division for concurrence the most appropriate treatment technology to develop during design activities.

3.1.5.1 Assumptions

- Ground-water samples shipped via express mail or hand-delivered to testing laboratories.

- The microfiltration testing laboratory will also analyze the resultant sludge (if any) for the full range of TCLP analytes to determine whether or not land disposal of the sludge will be possible.

- Sixty day performance period for treatability testing, including the generation of test reports by the subcontractor laboratories.

- No additional site visits to collect additional ground-water samples.

- Proposed staff: Senior Technical Engineer, CTO Manager, Chemical Engineer, and Clerical Support.

3.1.5.2 Deliverables

The treatability testing results and reports will be included as part of the design development submission.

3.1.6 Test Borings

Test borings are required to structurally characterize the soil in the area where a potential ground-water treatment building may be located. The bearing capacity of the soil will be calculated based on the geotechnical investigation and a determination will be made as to the suitability of the local soil to support a building and vehicular traffic. Additional borings will be taken along the route of the proposed hydraulic containment wall to evaluate subsurface conditions; the location of these borings will be based on the results of the aquifer testing and the ground-water modeling. Ten additional borings will be taken along the proposed utility routes. The test borings will be conducted by Angel Environmental Services, Inc. as a subcontractor to EA. During drilling operations on the landfill, EA will monitor the air around the borehole for organic vapors with a direct reading instrument such as an OVA equipped with an FID or PID.

3.1.6.1 Scope Basis

- Ten test borings to an average depth of 20 ft for foundation characterization of the treatment building. No decontamination of equipment is required between borings and containerization of cuttings is not necessary. However, split barrels, ends, and traps will be scrubbed with clean water between each sample.

- Ten test borings to an approximate depth of 60 ft to characterize soil conditions along the potential containment wall route. Approximately 20 ft of each boring will be through landfilled solid waste material. Decontamination of equipment will be required between each boring. Cuttings will be containerized in DOT-approved 55-gal drums. Depth

to ground water is approximately 6-15 ft. Decontaminate split-barrel sampler between samples.

- Ten test borings to an average depth of 10 ft to characterize soil conditions along proposed utility routes. Decontamination of equipment will be required between each boring. If any of these 10 test borings are on the landfill proper, the cuttings will be containerized in DOT-approved 55-gal drums. Decontaminate split-barrel sampler between samples.

- Borings will be filled with a 10:1 cement to bentonite grout. The grout will be placed from the bottom to the top of the hole in one continuous operation. Pumping will continue until undiluted grout flows from the boring at the ground surface.

- Two potential building locations will be investigated.

- Split-barrel samples taken every 5 ft.

- All boring locations will be staked and clearly marked by EA prior to the arrival of the subcontractor.

- Good site access.

- Final disposition of the cuttings will be the responsibility of NCBC-Davisville.

- EA supervising geologist to be onsite during the taking of test borings.

- Fifteen days of field time and four days of office time for EA's geologist to interpret data and prepare boring logs.

- Proposed staffing: Senior Technical Review, CTO Manager, Geotechnical Engineer, CADD Operator, and Clerical Support.

3.1.6.2 Deliverables

The results of the soil borings will be included as part of the design development submission.

3.2 DESIGN TASKS

The following description of the proposed design is organized by project deliverables, i.e., tasks associated with (1) the design development submission, (2) the final submission, and (3) the bidding documents submission. Individual aspects of design are fully described in the design development submission. As design progresses, the individual design aspects will continue to be enhanced, adjusted, or finalized until the entire bidding document set is complete and accepted by Northern Division. Therefore, the description of design tasks under subsequent submissions (final and bidding documents) will be somewhat shorter than the description of work items for the design development submission.

It must be noted that previous discussions with Northern Division staff have indicated that site studies conducted by TRC are still ongoing at this writing, and data from these studies will be used by EA as the basis for the remedial design. Until these studies are finalized, EA's exact work scope will be left somewhat unprecise.

3.2.1 Design Development Submission

The design development submission represents an approximately 35 percent design level of completion. The design will proceed in accordance with the standards identified in the Scope of Services. As indicated in the Statement of Services, a presentation of this stage of design will be made by EA at NCBC Davisville two weeks after the design development submission is sent to Northern Division. The anticipated individual components of the design development submission are described below.

3.2.1.1 An existing conditions topographic map as generated by the aerial survey.

3.2.1.2 Results of the treatability tests.

3.2.1.3 Preliminary design of a RCRA-type cap, including impermeable liner, drainage layers, and cover soil. The design of this cap will be in accordance with Rhode Island regulations.

3.2.1.4 Results of the SVCA with recommendations on the type and spacing of the gas management system. The gas management system will conform with federal and Rhode Island regulations. For purposes of this Work Plan, an active system with treatment is assumed.

3.2.1.5 Results of the aquifer testing and ground-water modeling.

3.2.1.6 Conceptual design of a ground-water pump and treat system, based on the ground-water modeling data and the results of the Phase II sampling provided by TRC. Individual extraction wells will be spaced around the site based on the results of the ground-water modeling. The treatment system will be designed to accommodate dewatering of the site based on a hydraulically isolated condition. The design concept is metals pre-treatment and organic compound treatment by air stripping or UV/chemical oxidation followed by carbon adsorption polishing. Since discharge to surface water or reinjection is anticipated, EA will investigate NPDES or other permit requirements and develop a draft permit application for review by Northern Division.

3.2.1.7 A discussion on the need for a hydraulic containment system, the technologies available, and an analysis of which alternative is best suited for the Allen Harbor Landfill site, based on existing site data provided by TRC and results of the exploratory soil borings conducted by EA.

3.2.1.8 Identification of potential locations for a ground-water treatment system building and associated access roadway and vehicular parking.

3.2.1.9 Identification of known utilities in the project area, as provided to EA by NCBC Davisville staff. Known utilities will be indicated on the site plan.

3.2.1.10 A discussion of site safety and health issues.

3.2.1.11 Preliminary stormwater management and erosion/sediment control design.

3.2.1.12 A preliminary landfill settlement analysis based on existing site geologic data provided by TRC and the test boring program.

3.2.1.13 With the exception of soil borings described in Section 3.1.9, EA does not anticipate any additional geotechnical testing at the site.

Deliverables

- A design analysis report containing the results of the treatability studies, the SVCA, the aquifer testing, and the ground-water modeling.

  The design-related assumptions, rationale, and calculations will be described in the design analysis report.

- Outline specifications to include marked-up NAVFAC guide specs for Division I, Table of Contents, and a brief outline of each technical specification section. EA will use the most recent edition of the SPECSINTACT system to generate the marked-up Division I specification sections provided with the design development submission.

- A design development submission drawing set generated on Autocad. Existing conditions will be obtained either from the NCBC Davisville staff or the aerial survey. Format of the drawings will be as described in the Northern Division A/E Guidance manual. Anticipated drawing sheets for the design development submission are:

  - Title sheet
  - Existing conditions plan
  - Cap grading plans, including gas management system outline
  - Pre- and post-development drainage area plans
  - Preliminary ground-water treatment system flow diagram

- A design development level engineer's construction cost estimate.
- Utility data sheets (if required).
- Local code, permitting, and inspection requirements report.
- Environmental permits requirements investigation and draft permit applications, if necessary.

Project Staffing

For the design deliverable submission, EA staff who were involved with the pre-design activities will remain involved at least until this initial submission is made. This provides for continuity of personnel and experience as the project moves into the design phase.

- Senior Technical Review - Engineering
- Senior Technical Review - Geology
- CTO Manager
- Project Engineer
- Civil Engineer
- Mechanical Engineer
- Chemical Engineer
- Geologist
- Hydrogeologist
- CADD Operators
- Clerical Support

3.2.2 Final Design

The final design will be a continuation and finalization of the design tasks initiated by the design development submission. The final design will be in accordance with the aforementioned design standards and with the Northern Division A-E Design Guide (dated 31 December 1991). For purposes of this Work Plan, those individual design tasks listed in

Section 3.2.1 are not repeated here; only the work aspects which are started after the design development submission are listed below. The final design is intended to reflect approximately a 95 percent design complete effort.

3.2.2.1 Results of the test boring investigation for siting the ground-water treatment building.

3.2.2.2 Design of the ground-water treatment building including structural, architectural, winterization, and electrical design. The building will be designed for year-round staffing, with an HVAC system, a lavatory, a fuel oil system, office space, and sludge and chemical storage space. The building will be located out of the areal limits or above the level of the 100-year flood.

3.2.2.3 Detailed design of the ground-water extraction and treatment system.

3.2.2.4 Detailed design of the automated controls for the ground-water treatment system.

3.2.2.5 Detailed design of treatment system discharge piping and outfall.

3.2.2.6 Detailed design of a hydraulic containment system (if necessary), including results of a compatibility test to evaluate the effect of the ground-water chemistry on the selected hydraulic containment system.

Deliverables

- A final design analysis report.
- A final construction cost estimate. Vendor quotes will be provided for all major remedial system components.
- Final specifications. NAVFAC guide specifications from the SPECSINTACT system will be used wherever possible. Original

marked-up guide specifications (Divisions 1-16) will be provided with the typed copies of each section. Anticipated specification sections are:

- General Paragraphs
- Additional General Paragraphs
- References
- Submittals
- Quality Control
- Environmental Protection
- Operation and Maintenance Data
- Clearing and Grubbing
- General Excavation, Filling, and Backfilling
- Crushed Aggregate Base Course
- Steel Sheet Piling
- Slurry Wall [alternate to Steel Sheet Piling]
- Storm Drainage System
- Exterior Water Distribution System (minor construction)
- Exterior Leachate Sewer System
- Extraction Wells
- Fence, Chain Link
- Turf
- Cast-in-Place Concrete
- Steel Doors and Frames
- Rolling Service Doors
- Steel Windows
- Pre-engineered Metal Building
- Ground-Water Treatment System
- Membrane Liner
- Geotextiles
- Bentonite Liner
- Drainage Layer and Final Cover
- Mechanical General Requirement
- Plumbing Systems

- Fuel Oil Handling System
- Pumps
- Unit Heaters
- Industrial Ventilation and Exhaust Systems (Ducts and Fans)
- Electrical General Requirement
- Overhead Electrical Work
- Interior Wiring System
- Interior Lighting
- Exterior Lighting
- Treatment System Controls

• A final construction drawing set. Order of drawings will be by discipline according to the A-E Design Guide. Anticipated drawing sheets are:

- Title sheet.

- Existing conditions plan.

- Final conditions plan showing landfill cap grading, gas management system, ground-water extraction system, location of treatment plant building, alignment of hydraulic containment wall, contractor staging area and access routes, and other site improvements.

- Site details.

- Capping and gas management details.

- Hydraulic containment plan and details.

- Erosion and sediment control

- Ground-water treatment system plan and elevations.

- Pre-engineered metal building.

- Electrical, showing single line diagrams and plan and elevation views of significant electrical features.

- Treatment system automated control schematic.

- P&ID

- Pre- and post-development drainage area maps.

- Final completed permit applications for Northern Division to submit to the appropriate agencies.

Projected Staffing

- Program Manager
- Senior Technical Reviewer - Engineering
- Senior Technical Reviewer - Pump and Treat System
- CTO Manager
- Project Engineer
- Civil Engineers
- Mechanical Engineer
- Electrical Engineer
- Chemical Engineer
- CADD Operators
- Clerical Support

3.2.3 Bidding Document Submission

This submission will incorporate Northern Division review comments on the final submission. Deliverables and project staffing requirements will be similar to those specified in Section 3.2.2.

3.3 MEETINGS AND REGULATORY SUPPORT

3.3.1 Scope Basis

- Meetings to be held at NCBC Davisville.
- One design review meeting for EA to make a presentation describing the design development submission and discuss review comments.
- One final design review meeting.
- One meeting with TRC Environmental Consultants, Inc. to discuss their work completed to date and the results of their data collection.
- Three meetings with the Technical Review Committee.
- Two meetings with RIDEM and EPA regulators and the Coastal Resources Management Council.
- All meetings to be attended by EA CTO Manager and Project Engineer. Additional EA staff may attend at extra cost as requested by Northern Division or as project conditions warrant.
- Round trip airfare from Baltimore to Providence and one-day lodging, car rental, per diem, and expenses for two people included.
- A total of 260 hours of CTO Manager time for meetings, regulatory communication, and coordination.
- Meeting minutes will be prepared by EA. Minutes will be submitted to Northern Division for distribution.

- No meetings at Northern Division or EA's Sparks, Maryland, office are included.

4. SCHEDULE AND DISTRIBUTION OF DELIVERABLES

4.1 SCHEDULE

Based upon CTO negotiations conducted on 26 August 1993 and issuance of CTO modification on 10 September 1993, the schedule shown on Table 4-1 is proposed for the Allen Harbor Landfill remediation project. This schedule assumes preliminary data to be received from TRC in September 1993 and the finalized data and the Phase II RI report to be available in mid-November 1993 (limited preliminary data from TRC was received by EA during the first week of October 1993). Meetings as specified in Section 3.3 will occur throughout the design schedule; the Technical Review Committee and regulatory meetings can be identified on the schedule at a later time. Although these meetings can provide valuable information to the project, the scheduling of these meetings is not critical to the project schedule shown on Table 4-1. The proposed schedule also assumes timely review of the design submissions by Northern Division, EPA, RIDEM, and the other reviewers.

4.2 DISTRIBUTION OF DELIVERABLES

The distribution of deliverables will be as set forth by the Distribution Schedule shown in Appendix A. The only change to the Distribution Schedule will be the addition of five additional copies of the drawings, specifications, design analysis, and reports and other data for the design development and final submission. These extra copies will be sent to the Coastal Resource Management Council, Save the Bay, and other concerned citizens' organizations. These additions to the distribution schedule were requested by Northern Division. EA shall express mail deliverables to the reviewers.

TABLE 4-1 REMEDIATION OF ALLEN HARBOR LANDFILL NCBC DAVISVILLE, RHODE ISLAND

PROJECT DELIVERABLES SCHEDULE

1.	Issuance of Modification (NTP)	10 September 1993
	Receipt of necessary preliminary data from TRC	10 September 1993
2.	Preliminary Draft Design Work Plan to Northern Division	22 October 1993
3.	Northern Division Review Comments on Preliminary Draft Design Work Plan to EA	5 November 1993
	Receipt of necessary final data from TRC	22 November 1993
	Draft Design Work Plan to Northern Division and Regulators	18 November 1993
	Review comments on Draft Design Work Plan to EA	17 December 1993
4.	Final Design Work Plan to Northern Division and Regulators	30 December 1993
5.	Design Development Submission	28 January 1994
6.	Design Development Comments to EA	11 February 1994
7.	Design Development Presentation at NCBC Davisville	18 February 1994
8.	EA Responses to Design Development Comments	25 February 1994
9.	Final Submission	22 April 1994
10.	Final Submission Comments to EA	6 May 1994
11.	Final Design Review Meeting at NCBC Davisville	13 May 1994
12.	Submission of Bidding Documents	27 May 1994

5. SUBCONTRACTING

EA proposes to subcontract the surveying, the taking of soil borings, and treatability testing to small businesses entities. Subcontractor quotes from several surveyors, drillers, and laboratories were solicited, and in each case the qualified low bidder was selected. EA's subcontractors are as follows:

- Surveying—ASM Technologies, Inc., Shrewsbury, Pennsylvania
- Test Borings—Angel Environmental Services, Inc., Seymour, Connecticut
- UV Oxidation Treatability Test—Ultrox International, Santa Ana, California
- Microfiltration Treatability Test—Memtek, Inc., Billerica, Massachusetts

APPENDIX A

STATEMENT OF A/E SERVICES
(DATED 6 JULY 1993)

NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
LESTER, PA

STATEMENT OF ARCHITECT-ENGINEER (A/E) SERVICES
UNDER
A/E CONTRACT N62472-92-D-1296

PART 1 - GENERAL INFORMATION

1.1 General Statement of Services

The A/E shall provide services in accordance with the requirements, schedules, guidance and information contained or referenced herein for the project listed below. All contract requirements shall be performed in accordance with the procedures outlined in the "Guide for Architect-Engineer Firms Performing Services for the Northern Division, Naval Facilities Engineering Command" dated 31 December 1991 (hereinafter referred to as the "A/E Guide"). By such reference, the A/E Guide shall form a part of this contract:

CONTRACT TASK ORDER (CTO) NO: CTO #0003
PROJECT TITLE: Design Cap For Allen Landfill
PROJECT LOCATION: NCBC Davisville
CONSTRUCTION CONTRACT #: N62472-93-C-0294
ESTIMATED CONSTRUCTION COST (ECC): $8,000,000
FY: 94 FUNDS: DERA JO #: AAAQ4002
ANTICIPATED DATE OF CONSTRUCTION CONTRACT AWARD (ADCA): 30 May 1994

1.2 Project Information

1.2.1 Project Description

Background: Allen Harbor Landfill is a 15 acre site bounded on two sides by Allen Harbor and was used for waste disposal from 1946 until 1972. Wastes known to be disposed in the site include: fuel/waste oil, sewage sludge, asbestos, paints, paint thinners, degreasers and PCB transformers. Contamination due to these sources includes soils with elevated levels of PAHs, PCBs, Arsenic, Berylium and various other pollutants. Site groundwater is known to contain elevated levels of chlorinated organics and various inorganics. In the Feasibility Study of January 1993, The Navy has recommended a landfill containment system and groundwater extraction system.

Scope: The A/E is requested to provide engineering services for the design f the landfill containment system and groundwater extraction system. The design shall include a clay cap (with venting and run-off controls), bentonite slurry walls (to hydraulically contain the site), a groundwater extraction system and treatment system capable of treating the contaminated leachate to allowable NPDES surface water discharge criteria. Water treatment shall consist of inorganics removal via microfiltration or chemical precipitation and chlorinated organics removal via UV oxidation. The following supplemental tasks are anticipated in addition to the traditional design documentation:

A. Geotechnical Investigation: including piezometric evaluation, monitoring well installation, ground penetration radar survey, and landfill gas analysis
B. Slurry Wall Evaluation: for leachate hydraulic conductivity assessment
C. Landfill Settlement Analysis: to assess consolidation
D. Groundwater Treatability Testing: for microfiltration, chemical oxidation and UV oxidation
E. Groundwater Modeling: flow applications only
F. Soil and Water Monitoring Program
G. Regulatory Support (Permits, Environmental Protection, Technical Review Meetings and Coastal Zone Management

1.2.2 Special Project Requirements/Criteria/Information

In addition to the criteria, guidance and information listed under Part 5, "Applicable Criteria, Guidance and Information," of this Appendix, the A/E's attention is directed to the following special project specific requirements, criteria and information:

1.2.2.1 Architectural: Handicapped accessibility is required at the proposed water treatment plant.

1.2.2.2 Structural: Design for seismic zone 2 is required.

1.2.2.3 Mechanical:

(1) The facility shall be designed to meet an Energy Budget of 50,000 BTU/SF/Year for the treatment plant office area and 30,000 BTU/SF/YR for the treatment area. The A/E shall calculate the energy consumption of this facility on a BTU/gross SF/year basis.

(2) Load calculations for HVAC design shall be based on the following weather data:

Location	N41 36' W71 27'
Elevation	25 feet

Winter Design Data - Heating

Degree Days	5840 annual
Dry Bulb Temp. (97.5%)	9 degrees F
Prevailing Wind Direction	WNW
Mean Wind Speed	10 knots

Summer Design Data - Air Conditioning

Dry Bulb Temp. (2.5%)	85 degrees F
Mean Coincident Wet Bulb (MCWB)	72 degrees F
Mean Daily Range	19 degrees F
Prevailing Wind Direction	SW

Summer Criteria Data - Air Conditioning

Dry Bulb Temp. greater than 93 degrees F	5 hours
Dry Bulb Temp. greater than 80 degrees F	290 hours
Wet Bulb Temp. greater than 73 degrees F	182 h urs
Wet Bulb Temp. greater than 67 degrees F	909 hours

(3) Metering of primary energy sources (fuel, electricity, steam, etc.) is required. In addition, energy consuming mechanical/electrical systems within the building shall be designed to for future submetering for HVAC, lighting, power demand, etc.

1.2.2.4 Facilities Protection:

(1) Fire Protection: The A/E shall design the project in accordance with Navy fire protection criteria.

(2) Physical Security and Loss Prevention: The project does not involve a secure area.

(4) Industrial Hygiene: Suspected potential health hazards involved in this project include asbestos, soil contamination and volatile organic compounds in the areas of the landfill. The A/E shall investigate and report on the method of solution to these hazards as specified herein and in the A/E Guide.

1.3 Points of Contact

1.3.1 Government points of contact for this project are:

1.3.1.1 Northern Division:

Contract Specialist (Code 0223):
Mr. T. Wallace
Tel: (215) 595 - 0633

Design Manager (Code 4051):
Mr. P. Briegel
Tel: (215) 595 - 0590

Project Manager (Code 1821):
Ms. M. Powers
Tel: (215) 595 - 0567

1.3.1.2 NCBC Davisville Public Works Department:

For purposes of coordinating site visits and obtaining site data (and record drawings) contact Mr. Lou Fayan at (401) 267-2245 (5) working days prior to the A/E's site visit.

PART 2 - CONTRACT REQUIREMENTS

2.1 Design Services

2.1.1 The A/E's standard contract requirements shall include preparation of the following documents for the project for each applicable discipline:

(1) Drawings, including Check Prints (see A/E Guide, Chapter 6)
(2) Specifications, including System Start-up and Test Procedures
(3) Cost Estimate
(4) Design Analysis (Basis of Design and Calculations)
(5) Reports of Testing and Modeling

2.1.2 A/E costs for the preparation of these documents shall be priced under Section B, Design Services, of the A/E fee proposal. Details for preparation of drawings, specifications, cost estimate and design analysis for each discipline are contained in the A/E Guide.

2.2 Specialized Services

In addition to Design Services, the A/E shall provide those Engineering Services, P st Construction Award Services (PCAS), and Supervision and Inspection Services marked thus, "X", in the list accompanying this paragraph. A/E costs for Engineering Services and PCAS shall be priced under Sections A and C respectively of the A/E fee proposal. Supervision and Inspection Services shall be unpriced until such time as the government elects to exercise those Phases of the contract. Detailed requirements for these services are contained in the referenced chapter of the A/E Guide or are detailed herein under the paragraph entitled, "Other Special Project Requirements."

SPECIALIZED SERVICES

Engineering Services (Section A)	A/E Guide Chapter
Meetings (and meeting minutes)	
__X___ (2) Regulatory Technical Review Meetings	
__X___ Design Development Presentation at NCBC Davisville	14
__X___ Final Design Review Meeting at NCBC Davisville	14
Site Investigation	
__X___ Existing Conditions Survey & Site Investigation Report	15
__X___ Topographic Survey of construction site covering approximately 15 acres	15
__X___ Geotechnical Investigation including:	
__X___ Soil Borings & Report for Primary Facility,	15
Utilities and Landfill Cap\Wall	15
__X___ Topsoil Tests & Report	15
__X___ GPR Analysis and Report	N/A
__X___ Permeability and Consolidation Evaluation and Report	N/A
__X___ Landfill Gas Analysis	N/A
__X___ Soil and Water Monitoring Program	
__X___ Groundwater Model and Report	N/A
__X___ Treatability Study and Report	N/A
__X___ Environ. Permit Requirements Investigation, Report and Permit Applications	15
__X___ Local Code, Permit and Inspection Requirements Investigation and Report	
Other Services	
__X___ Printing, Reproduction and Mailing	22
__X___ Travel and Subsistence	22
PCAS (Section C)	
Option Services	
__X___ Submittal Reviews	23
__X___ Consultation Services	23
__X___ Design Field Support	23
Supervision and Inspection Services (Contract Phases)	
__X___ Environmental Quality Assurance Monitoring and Inspection Services	24
__X___ General Supervision and Inspection Services	24

PART 3 - DESIGN MILESTONE SCHEDULE

3.1 Based on a Basic Contract award date of 13 August 1993, the A/E shall attend the following meetings and provide the government with the following design submissions and responses on or before the dates indicated:

Basic Contract	Date
Pre-Proposal Meeting at NCBC Davisville	03 August 1993
Design Workplan	27 August 1993
Design Development Submission	15 November 1993
D sign Development Presentation	29 November 1993
Design Development Submission Comments to A/E	29 November 1993
A/E Responses to Design Development Comments	13 December 1993
Final Submission	17 February 1994
Final Submission Comments to A/E	03 March 1994
A/E Response to Final Submission Comments	10 March 1994
Final Design Review Meeting	10 March 1994
Submission of Bidding Documents	24 March 1994

3.2 The A/E shall continue work on the project while submissions are being reviewed, unless instructed otherwise.

PART 4 - DISTRIBUTION OF DESIGN DOCUMENTS

4.1 The A/E shall forward all information using the transmittal letters provided in the A/E Guide.

4.2 Submissions shall be distributed prepaid by express mail to the following organizations and in accordance with the distribution schedule. The A/E shall insure that complete addresses are shown on the exterior of all letters and parcels:

1. Officer in Charge of Construction (OICC)
Northern Division, Naval Facilities Engineering Command
10 Industrial Highway
Mail Stop #82
Lester, PA 19113-2090

A. ATTN: Code 4051/PB
B. ATTN: Code 01821/MP

2. Resident Officer in Charge of Construction (ROICC)
Narragansett Bay Area
NETC Bldg 1
Newport RI 02840

3. INDUSTRIAL HYGIENE SECTION (CODE 03G)
Commanding Officer
Naval Hospital Newport
Newport RI 02841
Att'n: Industrial Hygiene Section

4. (HOST)
Commanding Officer
Naval Construction Battalion Center
Bldg 404
Davisville RI 02854-1161
Att'n: L. Fayan

5. US Environmental Protection Agency
Region 1
JFK Federal Building
Boston MA 02203-2211
Att'n: M. Daily

6. Rhode Island Department of Environmental Management
291 Promenade Street
Providence RI 02908-57667
Att'n: J. Crawford

DISTRIBUTION SCHEDULE

SUBMISSION	NO. OF COPIES TO: NORTHDIV A.	B.	ROICC	IND HYG	HOST	EPA	RIDEM
Design Workplan	2	-	-	-	1	1	1
Design Development (DD)							
1. Drawings (all disciplines)	9	-	2	1	1	2	1
2. Specifications							
a. Original Marked-Up Guide Specs (For Division I), Cover Sheet, Table of Contents and typed outline for each technical section	1	-	-	-	-	-	-
b. Copies of (a) above	9	-	2	1	1	2	1
3. Cost Estimate	5	-	-	-	-	-	-
4. Design Analysis (all disciplines)	9	-	-	1	1	2	1
5. Reports and Other Data							
a. Site Invest. Report	2	-	-	-	-	-	-
b. G otechnical Report	2	-	-	-	1	2	1
c. Topsoil Test Report	2	-	-	-	-	-	-
d. Draft Permit Applicatns.	2	-	1	-	-	1	1
e. Groundwater Model	2	-	-	-	1	2	1
f. Treatability Study	2	-	-	-	1	2	1
6. Utility Data Sheets	2	-	-	-	1	-	-
7. A/E Transmittal Letter (w/o enclosures)	-	1	-	-	-	-	-

DISTRIBUTION SCHEDULE

SUBMISSION	NO. OF COPIES TO: NORTHDIV A.	B.	ROICC	IND HYG	HOST	EPA	RIDEM
Final							
1. Drawings	9	-	2	1	1	2	1
2. Specifications							
a. Original Marked-up Guide Specs (Div 1 thru 16), Cover Sheet, Table f Contents from DD	1	-	-	-	-	-	-
b. Copy of (a) above	1	-	-	-	-	-	-
c. Typed copy of (a) above	9	-	2	1	1	2	1
3. Cost Estimate	4	-	-	-	-	-	-
4. Design Analysis	9	-	-	1	1	2	1
5. Final Permit Applications	2	-	-	-	-	-	-
6. A/E Transmittal Letter (w/o enclosures)	-	1	-	-	-	-	-
Bidding Documents							
1. Drawings, Originals plus indicated No. of Copies	5	-	-	-	-	-	-
2. Specifications							
a. Original Marked-up Guide Specs from Final	1	-	-	-	-	-	-
b. "Photo-Ready" Original Specification	1	-	-	-	-	-	-
c. Copies of (b) above	5	-	-	-	-	-	-
d. Return Typed copy from Final Submission	1	-	-	-	-	-	-
3. Cost Estimate	4	-	-	-	-	-	-
4. Design Analysis	5	-	-	-	-	-	-
5. A/E Transmittal Letter (w/o enclosures)	-	1	-	-	-	-	-

NOTE: Submission requirements listed above are in addition to meeting minutes, and responses to comments and proposals required during the course of the contract.

PART 5 - APPLICABLE CRITERIA, GUIDANCE AND INFORMATION

5.1 General

The A/E shall design the project in accordance with DOD and Navy criteria listed herein, the A/E Guide, standard engineering and architectural practice, other criteria listed herein, and specific technical guidance provided by the government at the A/E Orientation Meeting.

5.2 Information prior to Negotiations (Contract Award)

Prior to negotiations, the following information and guidance marked thus, "X", shall be provided to the A/E at no cost:

__X___ 1. A/E Guide (including Amendments [NONE]) (2 copies)
__X___ 2. NORTHNAVFACENGCOMINST 5090.5A, "Procedures and Responsibilities for Identifying and Obtaining Environmental Permits Required for Construction and/or Operation of New Facilities".
__X___ 3. Feasability Study dtd January 1993

5.3 Information Loaned to the A/E

One copy of the following information shall be loaned to the A/E during the life of this contract:

Information Applicable T This Contract	Number	Title	Issue Date	Change Date
		General		
___	MIL-HDBK-1190	Facility Planning and Design Guide (Section 8 Rev. 1 May 92)	Sep 87	
_X__	FED-STD-795	Uniform Federal Accessibility Standards (UFAS) (Design for Physically Handicapped Persons)	Apr 88	
		Design Manuals/Military Handbooks		
_X__	MIL-HDBK-1001/1	Basic Architectural Requirements and Design Considerations	Apr 92	
___	MIL-HDBK-1001/2	Materials and Building Components	Jul 87	
___	DM-1.03	Architectural Acoustics	May 85	
___	MIL-HDBK-1001/5	Roofing and Waterproofing	Feb 90	
___	MIL-HDBK-1002/1	Structural Engineering-General Requirements	Nov 87	
___	MIL-HDBK-1002/2	Structural Engineering-Loads	Sep 88	
___	MIL-HDBK-1002/3	Structural Engineering-Steel Structures	Sep 87	
___	DM-2.04	Structural Engineering-Concrete Structures	Sep 86	
___	MIL-HDBK-1002/5	Timber Structures	Mar 87	
___	MIL-HDBK-1002/6	Structural Engineering-Aluminum Structures, Composite Structures, Structural Plastics, and Fiber-Reinforced Composites	Jun 87	
___	DM-3.01	Plumbing Systems (DPL-88-0011)	May 86	
___	DM-3.03	Heating, Ventilating, Air Conditioning and Dehumidifying Systems (DPL-89-0005) (DPL-89-0011) (DPL-90-0004)	Jan 87	

Information Applicable To This Contract	Number	Title	Issue Date	Change Date
___	DM-3.5	Compressed Air and Vacuum Systems	Mar 83	
_X__	MIL-HDBK-1003/17A	Industrial Ventilation Systems		Jan 90
_X__	MIL-HDBK-1004/1	Electrical Engineering-Preliminary Design Considerations (DPL-87-0002) (DPL-89-0001) (DPL-90-0001) (DPL-09B-0002)	May 88	1-Nov 88
___	MIL-HDBK-1004/2A	Power Distribution Systems	Jan 92	
___	MIL-HDBK-1004/3	Switchgear and Relaying (DPL-88-0003) (DPL-88-0008)	Oct 87	
___	MIL-HDBK-1004/4	Electrical Utilization Systems (DPL-87-0002) (DPL-09B-0002) (DPL-88-0003)	Oct 87	1-Feb 91
___	MIL-HDBK-1004/6	Lightning Protection	May 88	
___	MIL-HDBK-1004/7	Wire Communications and Signal Systems	Sep 91	
___	MIL-HDBK-1004/10	Electrical Engineering Cathodic Protection (DPL-90-0006)	Jan 90	
___	MIL-HDBK-1005/2	Hydrology	Jun 90	
___	MIL-HDBK-1005/3	Drainage Systems	Sep 90	
___	DM-5.4	Civil Engineering-Pavements	Oct 79	1-Mar 86
_X__	MIL-HDBK-1005/7	Water Supply Systems	Nov 88	
_X__	MIL-HDBK-1005/8	Domestic Wastewater Control	Sep 88	
___	MIL-HDBK-1005/9	Industrial and Oily Wastewater Control	Sep 88	
___	DM-5.10	Civil Engineering-Solid Waste	Sep 86	

Information Applicable To This Contract	Number	Title	Issue Date	Change Date
		Disposal		
___	DM-5.12	Civil Engineering-Fencing, Gates, and Guard Towers	Oct 79	1-Apr 80
___	DM-5.14	Groundwater Pollution Control-Design Criteria and Procedures for Analysis	Jan 86	
_X__	MIL-HDBK-1006/1	Policy and Procedures for Project Drawings and Specifications Preparation (DPL-88-0004)	Jul 87	
___	DM-7.1	Soil Mechanics	Sep 86	1-Sep 86
___	DM-7.2	Foundations and Earth Structures	Sep 86	1-Sep 86
___	DM-7.3	Soil Dynamics, Deep Stabilization, and Special Geotechnical Construction	Apr 83	
_X__	MIL-HDBK-1008A	Fire Protection for Facilities Engineering, Design and Construction (Army TM 5-812-1) (DPL-88-0002) (DPL-89-0002) (DPL-88-0003) (DPL-89-0007) (DPL-88-0008) (DPL-91-0003)	Mar 88	
___	MIL-HDBK-1010A	Cost Engineering: Policy and Procedures	Aug 92	
___	DM-22	Petroleum Fuel Facilities (Interim Criteria 24 Feb 89 and 23 Oct 89)	Aug 82	
___	DM-26.2	Coastal Protection	Apr 82	
		P-Publications		
_X__	P-355*	Seismic Design for Buildings (Army TM 5-809-10 and Air Force AFM 88-3, Chapter 13)	Oct 92	
___	P-355.1*	Seismic Design Guidelines for Essential Buildings (Army TM 5-810-10-1 [5-809-10-1] and Air Force AFM 88-3, Chapter 13, Section A)	Feb 86	

*Tri-Service Manual

Information Applicable To This Contract	Number	Title	Issue Date	Change Date
___	P-418*	Dewatering and Groundwater Control (Army TM 5-818-5 and Air Force AFM 88-5, Chapter 6)	Nov 83	
		Other		
___	NORTHNAVINST 5090.5A	Procedures and Responsibilities for Identifying and Obtaining Environmental Permits Required for Construction and/or Operation of New Facilities	Mar 92	
___	OPNAVINST 5100.23B	Navy Occupational Safety and Health (NAVOSH) Program Manual	Aug 83	
	OPNAVINST 5530.14B	Physical Security and Loss Prevention	Dec 88	

*Tri-Service Manual

APPENDIX B

SITE SAFETY, HEALTH, AND EMERGENCY RESPONSE PLAN

Project No. 29600.03.4100

SITE SAFETY, HEALTH, AND EMERGENCY RESPONSE PLAN

SITE: Allen Harbor Landfill

LOCATION: NCBC-Davisville, Rhode Island

Approved by: _____ _____

Program Safety and Health Officer

Date

_____ _____

CTO Manager Date

SITE SAFETY, HEALTH, AND EMERGENCY RESPONSE PLAN (SHERP)

1. SITE: Allen Harbor Landfill
   LOCATION: NCBC, Davisville, Rhode Island
   SCHEDULED FIELD ACTIVITIES DATES: October-December 1993

2. KEY PERSONNEL AND RESPONSIBILITIES

2.1 CTO MANAGER: PETE PELLISSIER

The responsibilities of the CTO Manager include:

- Assuring compliance with the Program Safety and Health Management Plan (S&HMP) and this SHERP.
- Coordinating with the designated Navy Technical Representative (NTR).
- Preparing the SHERP.
- Providing overall supervisory control for safety and health protocols in effect for the project.
- Assigning the Site Manager and SSHO and assuring that the assigned onsite staff will enforce provisions of the approved SHERP.
- Submitting a letter to the COTR prior to initiating field work certifying that employees, including subcontractors and consultants, who will work onsite and who may be exposed to hazardous wastes, have completed training and are currently participating in a medical surveillance program in accordance with OSHA 1910.120, the NIOSH/OSHA/USCG/EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Activities" and the NEESA "Safety and Health Guidelines for Navy Assessment and Control of Installation Pollutants (NACIP) Confirmation Studies."
- Assuring adequate resources are available for safety and health.
- Preparing and submitting project reports.

2.2 FIELD ACTIVITIES MANAGER: JON PECKENPAUGH

The Field Activities Manager's responsibilities include:

- Providing technical support to the Site Manager and SSHO, particularly in the modification of site safety and health requirements.
- Evaluating onsite environmental monitoring results and reporting to the CTO Manager.
- Reviewing site health and safety documentation to ensure compliance with the Program Safety and Health Management Plan.

2.3 SITE MANAGERS: BECKIE BRISCOE AND RANDI AUGUSTINE

The Site Manager's* responsibilities include:

The Site Manager (or the senior site supervisor in the absence of the Site Manager) during any emergency will be responsible for initiating and coordinating responses. The Site Manager will:

- Work with the SSHO to identify and evaluate hazards.
- Be responsible for initiating the evacuation of the work site when needed, communicating with offsite emergency responders, and coordinating activities of onsite and offsite emergency responders.
- Determine if the abatement of hazardous conditions is sufficient prior to allowing resumption of work operations after an emergency.

2.4 SITE SAFETY AND HEALTH OFFICER: BECKIE BRISCOE
GEORGE LUKERT (Alternate)

The Site Safety and Health Officer's* (SSHO) duties include:

The SSHO will be onsite throughout the project and will be responsible for daily compliance with site safety and health requirements. The SSHO's responsibilities include:

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* Certification of 8-Hour Supervisor's Training for HWO required for SSHO and Site Manager.

- Conducting daily inspections of the site.
- Stopping work when imminent safety or health risks exist or as outlined in the site specific SHERP.
- Implementing usage of forms in Appendices.
- Implementing the SHERP.
- Providing an initial safety and health briefing to site workers and visitors and providing weekly safety and health meetings during the project performance.
- Reviewing training and medical records prior to site work.
- Evaluating reported hazardous conditions and recommending corrective action.
- Conducting necessary monitoring.
- Establishing and ensuring compliance with site control areas and procedures.
- Supervising decontamination to ensure decontamination of personnel, tools, and equipment.
- Supervising the distribution, use, maintenance, and disposal of personal protective clothing and equipment.
- Investigating and preparing incident reports as necessary.

2.5 FIELD PERSONNEL: BECKIE BRISCOE
GEORGE LUCKERT
RANDI AUGUSTINE
JOE FRIESEN
JON PECKENPAUGH

Subcontractors: Drillers: Angel Environmental Services, Inc., Seymour, CT
Surveyors: ASM Technologies, Inc., Shrewsbury, PA

Responsibilities of EA and subcontractor personnel include:

Employees (including subcontractor and consultant employees) will be responsible for:

- Following the site specific SHERP and applicable safety and health rules, regulations, and procedures.
- Using required controls and safety devices, including personal protective equipment.
- Notifying his/her supervisor of suspected safety or health hazards.
- Complying with training and medical requirements.

3. PURPOSE AND WORK SCOPE

- Conduct a soil vapor contamination assessment (SVCA).
- Gauging for site monitoring wells for tidal influence.
- Drilling exploratory soil borings.
- Placing markers for the aerial survey.

Work will take place in an area of a former landfill. Drilling will occur through the former landfill waste fill.

4. SITE DESCRIPTION:

The Allen Harbor Landfill consists of approximately 15 acres located on the western side of Allen Harbor. From 1946 to 1972, the site was used as a landfill for waste generated at NCBC Davisville and the former NAS Quoset Point. Reportedly, a variety of wastes, including preservatives, paint thinners, degreasers, polychlorinated biphenyls (PCB), asbestos, ash, sewage sludge, and contaminated fuel oil were disposed in the landfill, usually by burning and then covering. The site is presently covered with a final soil layer of varying depth and is significantly overgrown with tall grasses, scrub, and trees.

NCBC Davisville is located in the Town of North Kingstown, in the County of Washington, approximately 18 mi south of the City of Providence. The Allen Harbor Landfill is located approximately 3/4 mi northeast of the main NCBC Davisville installation. The landfill is bordered on the west by Sanford Road, on the north and south by low-lying marsh lands, and

on the east by Allen Harbor. Various marinas are located across Allen Harbor from the landfill, with pleasure craft typically maintaining anchorage just off the landfill. The landfill itself is no longer in use and is significantly overgrown with scrub and trees.

The surface of the landfill is generally flat, although there are some significant (~15 ft high) hills which have been created by waste material disposal. The eastern side of the landfill drops sharply down into Allen Harbor, on roughly a 1 to 1 slope.

5. TASK-BY-TASK HAZARD ANALYSIS:

5.1 Hazard Communication

A Material Safety Data Sheet (MSDS) for each chemical supplied by EA shall be kept onsite by the SSHS. EA employees and EA subcontractors shall be informed of the location of MSDSs. Subcontractors must inform EA about any hazardous substances that they bring to the site and provide appropriate MSDSs. Chemicals brought onsite must be properly labeled in accordance with OSHA's Hazard Communication requirements (29 CFR 1910.1200) and EA's Hazardous Materials Control program.

Chemicals which may be supplied by EA: methanol and non-phosphate detergent (decontamination), methane and isobutylene (calibration gases), nitric acid, sulfuric acid, hydrochloric acid (sample preservatives). MSDSs for these substances can be found in Attachment G of this SHERP.

5.2 Chemical Hazards

Potential routes of worker exposure to these chemicals (e.g., inhalation, skin contact) and expected magnitude of exposure are summarized below by task.

- SVCA: Soil gas survey will take place through soil which will contain solid waste. Chemical hazards may involve inhalation exposure to methane or other organic gases and exposure to potentially explosive levels of such gases.

- Boring Installation: Drilling will take place through soils which are presumed to be relatively free of contaminants. Therefore, the likelihood of exposure during drilling is expected to be low. However, all site workers should take precautions to guard against dermal and eye contact with potentially contaminated soil.

- Tidal Influence Monitoring: Levels of contamination have been shown to be relatively low in ground water. Potential routes of exposure are dermal and eye contact with contaminated ground water.

During all phases of the work, strict adherence to the monitoring procedures in Table 3 will help protect against inhalation of organic vapors.

5.3 Physical Hazards

Physical hazards are listed below for each work task (Physical Hazard Information Sheets can be found in Attachment D):

- SVCA: Cold Stress, General Physical Hazards.
- Boring Installation: Heavy Equipment Hazards, General Physical Hazards, Cold Stress, Drilling.
- Tidal Influence Monitoring: Cold Stress, General Physical Hazards

6. EMPLOYEE TRAINING ASSIGNMENTS:

Dates of training must be documented in Table 1. Any person who does not meet these training requirements is prohibited from engaging in site operations. Once the SHERP has been signed by the CTO Manager and the Program Manager, no other personnel may be added to the project field work without prior written approval by the CTO Manager or SSHO, who must review the proposed employee's training and medical status. The following training must be completed prior to the start of work operations:

All Site Workers:

- Prior to project start-up, 40 hours of initial offsite Hazardous Waste Operations (HWO) training and 3 days onsite training under the direct supervision of a more experienced site worker.
- Eight-Hour annual HWO refresher training (if >12 months have passed since 40-hour initial training or previous 8-hour refresher.

Site Manager, SSHO: Above requirements for site workers, plus one-time 8-Hour Supervisor's Training.

First Aid/CPR: At least two onsite workers must be currently certified in both first aid and CPR by the American Red Cross or equivalent organization. First aid training must be updated every 3 years; CPR training must be updated annually.

TABLE 1

SITE WORKER TRAINING AND PHYSICAL EXAMINATION RECORD

SITE: Allen Harbor Landfill, NCBC-Davisville, Rhode Island
CTO NO.: 0003

Project No. 29600.03
Task No.: 4100

NOTE: No employees other than those listed below are permitted to work onsite without prior written approval by the CTO Manager or SSHO.

Name	HAZWOPER 40-Hour Initial	HAZWOPER Annual	First Aid[a]	CPR[a]	Supervisor[b]	Medical Exam	Fit-Test[c]
Becky Briscoe	10/13/89	10/22/92	08/07/92	04/16/93	09/05/90	11/17/92	
John Peckenpaugh	09/03/93						
Pete Pellissier	01/31/88	02/22/93	01/08/93	01/08/93		01/06/93	
George Lukert	11/15/90	06/01/92	07/22/92	07/22/92	06/02/92		
Randi Augustine		01/23/93	06/08/93		01/92	02/17/93	
Pete Kotulak	01/31/88	04/27/92	05/13/91	01/08/93	12/04/90	12/30/92	
Joe Friesen							

(a) At least two people onsite must have current certification in First Aid/CPR for all tasks.
(b) At a minimum, the SSHO or site manager must have had supervisor's training.
(c) When air-purifying respirators are required.

Pre-Entry Briefing: Site workers will read the SHERP and will indicate their understanding of the requirements by signing Attachment A, Site SHERP Review Record. The SSHO must check the training status of all onsite personnel and then brief workers on the potential hazards at the site and protective measures to be implemented, both prior to entry and daily during the work. An evacuation location to be used in the event of an emergency must be designated to all personnel. This location should be an upwind point from site activities, in an area not expected to be affected by emergency situations onsite. The SSHO must brief visitors prior to initial entry. Visitors are not permitted to enter areas where they may be exposed to hazardous substances if they do not meet the training requirements summarized above.

Subcontractor Training: Prior to the start of work operations, the CTO Manager must obtain a written list of subcontractor personnel to be present onsite, and written certification from the subcontractor management that these workers meet the training requirements summarized above.

Non-hazardous waste site workers will be trained to meet applicable OSHA requirements specific to their work. Training records and certification letters will be managed and maintained per the Program Management Plan.

7. MEDICAL SURVEILLANCE:

Hazardous waste site workers must have satisfactorily completed a comprehensive physical examination within 12 months prior to the start of site operations. Non-hazardous waste site workers will be medically examined to meet OSHA requirements specific to their job. The date of physical examination of each site worker will be recorded as on Table 1. Subcontractors shall provide this information in writing to the CTO Manager for their workers onsite. Medical surveillance protocols for hazardous workers must comply with 29 CFR 1910.120. Records will be managed and maintained per the Program Management Program.

8. PERSONAL PROTECTIVE EQUIPMENT (PPE):

Based on evaluation of the potential safety and health hazards (Section 5), the required initial levels of PPE are presented in Table 2 for each work task. Upgrade and downgrade PPE levels are listed below:

Upgrade PPE Level: C. Components: Steel toe/steel shank neoprene safety boots, poly-coated tyvek coveralls, latex inner gloves, nitrile or neoprene outer gloves, hardhat, full face air purifying respirator with organic vapor/HEPA cartridges.

TABLE 2

PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

SITE: Allen Harbor Landfill; NCBC-Davisville, Rhode Island Project No. 29600.03.4100

Work Task	Initial Level of Protection	Specific PPE
SVCA; Drilling; Tidal Monitoring	D	Steel toe/steel shank safety boots, cotton coveralls, safety glasses, hardhat (drilling only), latex inner gloves, butyl/neoprene outer gloves*, faceshield (drilling operator only), hearing protection (during drilling only)

* Work gloves may be worn during drilling. Butyl/Neoprene outer gloves and latex inner gloves are to be worn during tidal monitoring and when contact with contaminated soil or ground water.

Downgrade PPE Level: None

Only the SSHO can authorize an upgrade or downgrade in the PPE level worn onsite, using only those criteria presented in Section 9. Changes in PPE levels must be documented on Attachment B, along with the rationale for the PPE changes. When respirators are required, site workers must have been successfully fit-tested within one year prior to the start of work operations. Fit-test dates are summarized in Table 1.

All subcontractors are required to supply their workers with the appropriate PPE.

The SSHO will review appropriate procedures for donning and doffing PPE prior to the start of work tasks. PPE must be inspected by site workers prior to use and regularly during use. If any site worker experiences a failure or alteration of PPE that affects the level of protection offered, that person shall immediately leave the Exclusion Zone. Re-entry shall not be permitted until the equipment has been repaired or replaced.

9. ENVIRONMENTAL MONITORING:

9.1 Environmental Monitoring Requirements

Task-specific environmental monitoring requirements are summarized in Table 3, including the type of monitoring to be performed, the frequency and location of monitoring, action levels, and required responses if action levels are detected. Only personnel trained in proper use and calibration may use the instruments.

Measurements must be logged on the Environmental Monitoring Record, Attachment C. If no detectable levels are measured, this must be documented on Attachment C at least once every 30 minutes. Each exceedence of an action level must be documented on Attachment C, along with the corrective action taken.

If a determination is made by the SSHO, based upon environmental monitoring and visible dust emissions, that full shift personnel or environmental monitoring is necessary, monitoring will be conducted according to NIOSH, OSHA, and EPA protocols. Visible dust in the breathing zone will require dust suppression or monitoring. If visible dust continues in the breathing zone after suppression is implemented, upgrade to Level C is required.

9.2 Calibration of Monitoring Instruments (one calibration procedure sheet is shown in Attachment F for each instrument listed in Table 3.)

TABLE 3 ENVIRONMENTAL MONITORING REQUIREMENTS

Task	Instrument	Frequency and Location	Action Levels	Required Response
Boring Installation; Tidal Monitoring	PID **with 11.7eV lamp** or FID	Initially and every 10 minutes in the breathing zone	0-1 ppm above background for 5 minutes	Evacuate to a safe upwind location and wait for levels to dissipate. Retest the area after 15 minutes. If levels have not dissipated continue work in Level C PPE.
			1-5 ppm above background	Continue work in Level C PPE. Monitor continuously.
			>5 ppm above background	Evacuate to a safe upwind location immediately. Retest the area after 15 minutes wearing Level C PPE. If levels have not dissipated in 30 minutes, contact the EA CTO Manager and Program Safety and Health Officer.
Boring	CGI	Initially and every 10 minutes during soil disturbance. Measure at surface of hole.	0-10% LEL	Continue.
			10 - 20% LEL	Continuous monitoring. Prepare to shut down.
			>20% LEL	Shut down. Contact SSHO and CTO Manager.

The calibration of each instrument must be checked at the beginning of each day of use and at least once during the day. The instrument must be recalibrated whenever it is turned "on" after being turned "off."

10. SITE CONTROL

10.1 Work Zones

Work zones have been established as follows and shall be delineated on the site map/sketch.

Exclusion (EZ): A 25-ft radius from any drilling, SVCA, or pumping test operation.

Contamination Reduction (CRZ): Delineated by the SSHO. All decontamination procedures must take place in the CRZ. There shall be only one access point between the EZ and CRZ.

Support: EA vehicle

Personnel who enter any of the work zones must sign the Site Entry and Exit Log, Attachment H.

10.2 Safe Work Practices

Safe work practices to be followed by site workers include:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited in the Exclusion and Contamination Reduction Zones.
- Hands and face must be thoroughly washed upon leaving the work area.
- Prescription drugs must not be taken by personnel unless specifically approved by a licensed occupational physician who is familiar with the issues of worker exposure to hazardous materials.
- When respirators are required, facial hair that interferes with the face-to-facepiece fit of the respirator will not be permitted.
- Contact lenses will not be permitted to be worn in the Exclusion or Contamination Reduction Zones.
- Personnel onsite must use the buddy system; visual contact must be maintained between team members at all times.

- Work is allowed during daylight hours only.

- If dust is being visually generated in the Exclusion Zone, the SSHO will advise on procedures for misting or wetting the soil to prevent possible exposure from inhalation of soil contaminants.

- Possessing, using, purchasing, distributing, selling, or having controlled substances in your system during the work day, including meal or break periods onsite, is strictly prohibited.

- The use of possession of alcoholic beverages onsite is prohibited. Similarly, reporting to work or performing one's job assignments with excessive levels of alcohol in your system will not be permitted.

11. DECONTAMINATION PROCEDURES:

11.1 Personnel Decontamination

Remove and discard boot covers, if worn. Wash boots with detergent and water; rinse. Wash outer gloves with detergent and water; rinse; and remove. Remove coveralls, then respirator, if worn. Remove and discard inner gloves. Wash hands, face, and other exposed skin with soap and water. Shower and shampoo as soon as possible at the end of the work day, before dining or social activities. Place nondisposable coveralls in plastic bags prior to leaving the site and prior to entering any EA vehicle. Launder nondisposable clothing worn in the exclusion zone prior to reuse, separately from other laundry items.

11.2 Equipment Decontamination

Wet-wipe instruments used onsite with clean water prior to leaving the site. Wet-wipe respirator exteriors whenever exiting work areas. Clean respirators with a manufacturer-recommended sanitizer, then hang to drip dry, and place in plastic bags for protection against dust. Change respirator cartridges at least daily, when breakthrough occurs, or when breathing resistance becomes high, whichever occurs first. Used cartridges shall be damaged to prevent accidental reuse.

11.3 Vehicular Decontamination

Vehicles that enter the exclusion zone must be decontaminated in the contaminant reduction zone. At a minimum, a thorough detergent and water wash is required. No visible soil shall remain on the exterior (including wheels) and the interior shall be wet wiped to remove visible dust and soil.

11.4 Waste Disposal Procedures

Potentially contaminated materials and equipment must be disposed of properly. Clothing, tools, buckets, brushes, and all cleaning solutions and spoils must be secured in drums or other leak-proof containers and correctly labeled. It is projected that decontamination liquids will be run through the carbon canisters for the aquifer testing prior to discharge onto the ground.

12. EMERGENCY RESPONSE PLAN:

Prior to work startup, all personnel must be familiar with this Emergency Response Plan. The CTO Manager must make this plan available for inspection and copying by all subcontractors. Rehearsals of emergency procedures should be performed regularly as part of the ongoing site safety program. Review the location of evacuation areas and exit routes. Determine the location of the nearest operating telephone for emergency use.

EA site personnel must immediately stop work, evacuate the Exclusion Zone and report to the EA Site Manager under any of the following potential emergency situations:

- Injury to any EA or contractor personnel.
- Discovery of any unexpected chemical hazards.
- Any chemical release or spill.

12.1 Procedures for Handling Emergency Incidents

In the event of an emergency, the information available at that time must be properly evaluated and the appropriate steps taken to implement the emergency response plan. The Site Manager (or SSHO if the Site Manager is part of the emergency) shall assume command of the situation. He/She must call the appropriate emergency services, evacuate personnel to the predesignated evacuation location as needed, and take other steps necessary to gain control over the emergency. Emergency telephone numbers, directions to the nearest hospital, and the location of the nearest telephone and other site communication equipment are presented in Table 4.

Give the following information when reporting an emergency:

1. Name and location of person reporting;
2. Location of accident/incident;
3. Name and affiliation of injured party;
4. Description of injuries, fire, spill, or explosion;
5. Status of medical aid and/or other emergency control efforts;

TABLE 4

EMERGENCY INFORMATION

SITE: Allen Harbor Landfill, NCBC-Davisville, Rhode Island Project No. 29600.03.4100

Nearest telephone (give location, directions, & phone no.): Mobile phone in EA vehicle

Other site communication equipment: None.

Name	Phone Number
Police: North Kingstown Police Department	(401) 294-3311
Fire: North Kingstown Fire Department	(401) 294-3344
Ambulance: North Kingstown Fire Department	911
Hospital: Kent County Memorial Hospital	(401) 737-7000

Directions to hospital (see map in Attachment E): Exit site; turn left on Sanford Road; turn right on Newcomb Road. Follow Newcomb until it intersects with U.S. Route 1; go north on U.S. Route 1 approximately 2 miles. Make a left onto Route 402 (Frenchtown Road). Stay on Route 402 approximately 1 mile; go north on Route 4 about 3 miles until Route 4 intersects with Interstate 95. Follow I-95 north; exit I-95 at Exit 10. At bottom of ramp, turn right onto Centerville Road. Make a left on Toll Gate Road. Hospital is approximately 3/4 mile on right.

NAVFAC Technical Manager **Paul Briegel**	**(215) 595-0590**
EA CTO Manager Pete Pellissier	(800) 876-4950 (work) (717) 235-4407 (home)
Program Safety and Health Officer Kris Hoiem, CIH	(800) 876-4950 (work) (410) 357-5485 (home)
EA Medical Services: Name: Johns Hopkins Center for Occupational and Environmental Health Address: 301 Bayview Blvd. Baltimore, Maryland	(301) 550-2322
EA Corporate Medical Director Dr. Shirley Conibear	(312) 782-4486
In case of spill, contact Sam Morekas/EA	(800) 876-4950
In case of accident or exposure, contact the EA Human Resources representative within 24 hours: Name: Cheryl MacDonald	(410) 584-7000
Site Managers Randi Augustine Beckie Briscoe	 (617) 784-1767 (410) 771-4950
SSHO Beckie Briscoe	(410) 771-4950

6. Details of any chemicals involved;
7. Summary of accident, including suspected cause and time it occurred;
8. Temporary control measures taken to minimize further risk.

This information is not to be released under any circumstances to parties other than those listed in this section and emergency response team members.

Once emergency response agencies have been notified, the EA CTO Manager and Manager, Health and Safety must be notified immediately.

12.2 Medical Emergencies

Personnel should always be alert for signs and symptoms of illnesses related to chemical, physical, and disease factors onsite. Severe injuries resulting from accidents must be recognized as emergencies and treated as such. At least two personnel currently trained in first aid/CPR must be present onsite at all times.

In a medical emergency, the Site Manager (or the SSHO if the Site Manager is not available) must sound the emergency alarm, upon which work must stop and personnel must move to the decontamination area. Personnel currently trained in first aid will evaluate the nature of the injury, decontaminate the victim if the victim can be moved safely, and initiate first aid assistance immediately. First aid shall be administered as appropriate. The local Emergency Medical Services must be notified immediately if needed. Victims who are heavily contaminated with toxic or dangerous materials must be decontaminated before being transported from the site. No persons shall re-enter the Exclusion Zone until the cause of the injury or symptoms has been determined. A fellow EA worker must accompany injured workers to the hospital to inform the admitting clerk that the injury is work related and to assist in completing the insurance forms.

The Site Manager must complete an EA Accident Investigation Report (Attachment I) and submit it to the EA CTO Manager and Manager, Health and Safety within 24 hours of the following types of incidents:

- Job-related injuries and illnesses.
- Accidents resulting in significant property damage.
- Accidents involving vehicles and/or vessels.

- Accidents in which there may have been no injury or property damage, but which have a high probability of recurring with at least a moderate risk to personnel or property.

- An accident which results in a fatality or the hospitalization of 5 or more employees must be reported within 24 hours to the U.S. Dept. of Labor via the EA Human Resources representative. Subcontractors are responsible for notification involving their employees.

First aid/emergency equipment is available at the following locations:

First Aid Kit: EA vehicle
Eye Wash: Contamination Reduction Zone
Shower: N/A
Fire Extinguisher (list type): Type A,B,C; EA vehicle
Emergency Alarm: Kept onsite with the SSHS
Other: None

The eye wash kit must be portable and capable of supplying at least a 15-minute supply of potable water to the eyes.

12.3 Fire/Explosion Emergencies

Any fire or explosion must be immediately recognized as an emergency. The Site Manager (or SSHO if the Site Manager is not available) must sound the emergency signal and personnel must be evacuated to the predesignated evacuation location and the local emergency services notified. Decontamination will take place once all personnel have been safely evacuated to the pre-designated evacuation location. Only persons properly trained in fire suppression, spill control, and other emergency response procedures should attempt to deal with these situations. Other than small fires or spills, local emergency response services must be notified to handle the emergency. The Site Manager should take measures to reduce injury and illness, primarily by evacuating personnel as quickly as possible. He/she must then notify the CTO Manager. Cleanup after such events may require specialized services. Work shall not resume until the SSHS declares the incident closed.

13. CONFINED SPACE ENTRY PROCEDURES:

No confined space entry is permitted or anticipated.

14. SPILL CONTAINMENT PROCEDURES:

Small incidental spills, i.e., those that cause no injury to personnel or the public, should be cleaned up quickly. For large spills, i.e., those that contaminate personnel or the environment, attend to first aid measures first, stop the source of the spill if possible, then notify the Program Manager and the Navy. The Site Manager (or the SSHO in his/her absence) will notify the CTO Manager as soon as possible. Spills of hazardous materials or wastes that are listed by EPA as having a reportable quantity (RQ) value must be reported to appropriate federal, state, and local agencies if a RQ or greater is released. It is the Navy's responsibility to contact other appropriate federal, state, and local agencies.

ATTACHMENT A

SITE SAFETY, HEALTH, AND EMERGENCY RESPONSE PLAN REVIEW RECORD

Site Name: Allen Harbor Landfill, NCBC-Davisville, Rhode Island CTO No.: 0003
Project No.: 29600.03 Task No.: 4100
SHERP Date:

I have read this Site Safety, Health, and Emergency Response Plan for this site and have been briefed on the nature, level, and degree of exposure anticipated as a result of participation in this project. I agree to conform to the requirements of this Plan.

Name	Signature	Affiliation	Date

Project No.: 29600.03.4100

ATTACHMENT B

SITE SAFETY AND HEALTH ACTIVITY REPORT

Site: Allen Harbor Landfill Location: NCBC-Davisville, Rhode Island

Weather Cond.: _____ Onsite Hours: From _____ To _____

Changes in PPE Levels*	Work Operations	Reasons for Change

Site Safety and Health Plan Violations	Corrective Action Specified	Corrective Action Taken (yes/no)

Observations and Comments: _____

Completed by: _____ Date: _____
Site Safety & Health Officer

*Only SSHS may change PPE levels, using only criteria specified in SSHP.

ATTACHMENT C

ENVIRONMENTAL MONITORING RECORD

Site Name: Allen Harbor Landfill, NCBC-Davisville, Rhode Island CTO No.: 0003
Project No.: 29600.03 Task No.: 4100

INSTRUMENT: _____

CALIBRATION: Gas: _____ Conc: _____ Span: _____

Time	Monitoring Location	Reading	Corrective Action Taken(a)

Comments: _____

(a) Corrective actions taken must be documented whenever readings at or above action levels are reached.

Recorded By: _____ Date: _____
Site Safety & Health Officer

ATTACHMENT D

PHYSICAL AND BIOLOGICAL HAZARD INFORMATION SHEETS

PHYSICAL HAZARD INFORMATION SHEET:
COLD STRESS

Cold stress hazards are most likely to occur at low temperatures or low wind chill factors, with wet, windy conditions also contributing to risks. All personnel should be familiar with cold stress symptoms, which include:

- Hypothermia: Cold-induced decreasing of the core body temperature that produces shivering, numbness, drowsiness, and muscular weakness. If severe enough, it can lead to unconsciousness and death.

- Frostbite: Constriction of blood vessels in the extremities, decreasing the supply of warming blood. May result in formation of ice crystals in the tissues, causing tissue damage. Condition may range from frostnip which is a numbing of extremities, to deep-freezing tissue beneath the skin. Symptoms include white or grayish skin, blisters, numbness, mental confusion, failing eyesight, fainting, shock, and cessation of breathing. Death may occur from heart failure.

Pain in the extremities may be the first warning of cold stress, and precautions (see below) should be taken to reduce exposure. Maximum severe shivering must be taken as a sign of immediate danger to the worker, and exposure to cold must be immediately terminated. Personnel exhibiting signs and symptoms of cold stress must be removed from the site, decontaminated, and given appropriate first aid. Emergency medical services must be contacted if symptoms are severe (e.g., more than numbness of the extremities or shivering). When air temperatures are less than 36 F (including wind chill), workers who become immersed in water or whose clothing becomes wet must be immediately provided a change of clothing and be treated for hypothermia.

To prevent cold stress when air temperature is less than 40 F (including wind chill), personnel should wear layers of loose-fitting clothing including insulated coveralls, head covering, and boots. Protection of the hands, feet, and head is particularly important because these are likely to be injured first by cold. However, actual injury to hands, feet, and head is not likely to occur without prior development of early signs of hypothermia such as numbing and shivering. Bare skin contact with cold surfaces (below 20 F) must be avoided. Personnel should wear wind-resistant outer shell to decrease wind chill effects. No continuous exposure to cold is permitted when the air speed and temperature results in an equivalent chill temperature of 26 F or less.

A temperature-dependent work regimen limiting lengthy periods of outdoor activity may be necessary. Workers entering heated shelters should remove the outer layer of clothing and loosen remaining clothing to permit sweat evaporation. Dehydration must be avoided by drinking warm drinks or soups.

PHYSICAL HAZARD INFORMATION SHEET: GENERAL PHYSICAL HAZARDS

Hazardous waste and other field operation sites include many basic safety hazards, such as:

- Holes, ditches, etc., posing fall, cave-in, and other hazards;
- Precariously positioned objects, which may cause crushing or other injuries;
- Sharp objects (e.g., nails, metal shards, glass), which may cause cuts, injection, or other injuries;
- Slippery surfaces, posing slip and fall hazards;
- Steep grades and/or uneven terrain, posing slip, trip, and fall hazards;
- Unstable surfaces (e.g., walls that may cave-in, unstable underground structures) which may pose fall, crushing, or other injuries.

Basic safety hazards can directly injure workers and create additional hazards. For example, a person may trip due to uneven terrain, fall and be cut on rusty metal shards, and become inoculated with contaminants adhering to the metal.

Site personnel should look constantly, closely, and carefully for these basic safety hazards and immediately inform the SSHO of any conditions that they feel may be hazardous.

PHYSICAL HAZARD INFORMATION SHEET:
HEAVY EQUIPMENT HAZARDS

The use of heavy equipment (e.g., backhoes, dump trucks, generators, compressors, etc.) may pose a variety of health and safety hazards to site workers.

All heavy equipment work must be conducted only by trained, experienced personnel. Equipment backing up, swinging loads, buckets, booms, and counter-weights pose serious hazards to ground personnel. If possible EA personnel must remain outside the turning radius of any large, moving equipment. At a minimum, EA personnel must maintain visual contact with the equipment operator when the equipment is active.

No EA personnel are permitted to work underneath heavy equipment, because this practice poses serious crushing hazards.

Belts, pulleys, sheaves, gears, chains, shafts, clutches, drums, flywheels, and other moving parts of equipment can pose injury hazards. No guard, safety appliance, or other device may be removed or made ineffective unless repairs or maintenance are required, and then only after power has been shut off and locked out. Safety devices must be replaced once repair/maintenance is complete.

Exhaust from all equipment powered by steam or combustion engines must be properly located so that release of exhaust does not endanger workers or obstruct the view of the operator. Gasoline-operated equipment must be re-fueled properly to prevent fire hazards; power must be off, no smoking allowed, and proper dispensing equipment must be used.

When not operational, equipment shall be set and locked so that it cannot be activated, released, dropped, etc. Backhoe buckets must be lowered to the ground.

Site-Specific Hazards and Protective Measures:

_____

_____

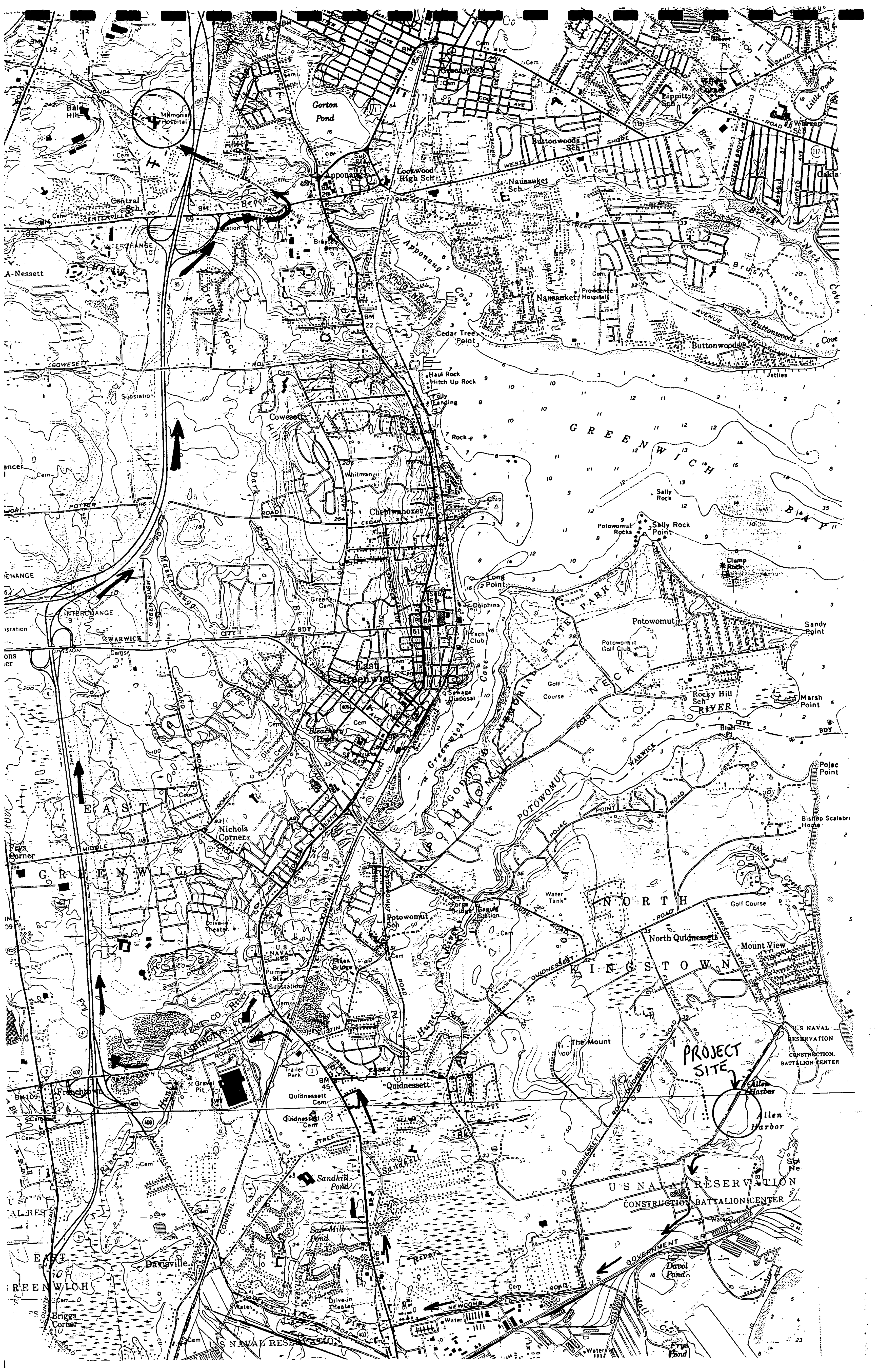
_____

_____

_____

ATTACHMENT E

MAP TO HOSPITAL



PROJECT SITE
Allen Harbor
Gorton Pond
Apponaug
Lockwood High Sch
Buttonwoods
Nausauket
Brush Neck Cove
Greenwich Bay
Sally Rock Point
Potowomut Rocks
Potowomut
Sandy Point
Marsh Point
Pojac Point
Long Point
Cowesett
Chepiwanoxet
East Greenwich
Greenwich Cove
Goddard Memorial State Park
Nichols Corner
Frenchtown
Quidnessett
North Quidnessett
Mount View
North Kingstown
The Mount
Sandhill Pond
Saw Mill Pond
Davisville
Davol Pond
Briggs Corner
U S Naval Reservation
Construction Battalion Center
Memorial Hospital
Ball Hill
Central Sch
Interchange
Cedar Tree Point
Warwick
Potowomut River
Hunt River
Frys Pond

ATTACHMENT F

MONITORING INSTRUMENT CALIBRATION PROCEDURES

STARTUP AND CALIBRATION PROCEDURE FOR MODELS OVA-128 AND 128-GC CENTURY ORGANIC VAPOR ANALYZER

STARTUP:

1. Connect the probe/readout assembly to the Sidepack Assembly by attaching both the sample line and the electronic jack.

2. Move the Instr/Batt Switch to the BATT position and check that readout needle moves beyond the white "batt check" line.

3. Move the Instr/Batt Switch to the "On" position and warm up at least 5 minutes.

4. Turn the Pump Switch on, set Sidepack Assembly in upright vertical position, and make sure that sample flow rate is approximately 1.5-2.5 units. If less, check filters.

5. Set CALIBRATE Switch to the X1 position, and use CALIBRATE knob to set meter to read 0.

6. Open the HYDROGEN TANK VALVE one or two turns. [Hydrogen Tank pressure should read at least 1,500 psi if 8-hour supply is desired. Otherwise, shut down instrument and fill tank with hydrogen.] Open HYDROGEN SUPPLY VALVE one or two turns. Hydrogen Supply Pressure Indicator should read between 8 and 12 psi.

7. Wait approximately 1 minute, then depress IGNITER Button until hydrogen flame lights (meter needle will jump upscale and faint "pop" may be heard if flame ignites). Do not depress igniter more than 6 seconds. If flame does not light, wait 1 minute and tray to re-ignite.

8. Use CALIBRATE know to "zero" out background by setting CALIBRATE Switch to X1 and reading zero on meter. To avoid false flame out alarm, set meter to 1 ppm with CALIBRATE knob and make differential readings.

CALIBRATION:

1. Fill empty Tedlar bag with 100 ppm methane gas standard.

2. Use Tygon Tubing to connect bag to probe on OVA Readout Assembly. Never connect the OVA directly to methane gas tank.

3. Set CALIBRATE Switch to X10 and read meter. If meter does not read 100 ppm, use the GAS SELECT KNOB to set the readout meter to correspond to 100 ppm. Lock the GAS SELECT KNOB.

4. RECORD identity of calibration gas, concentration, and GAS SELECT reading on Environmental Monitoring Record each time instrument is calibrated.

STARTUP AND CALIBRATION PROCEDURE FOR THE HNU PHOTOIONIZATION DETECTOR, MODELS HW-101 AND PI-101

STARTUP:

1. Connect the probe to the readout assembly, making sure that the red interlock switch is depressed by the ring on the connector.

2. Turn the function switch to BATT. The needle should move to green region. If not, the battery needs to be recharged.

3. Zero Set--Turn the function switch to STANDBY. Allow the instrument to warm up at least 1 minute. Set the zero point with the ZERO set control.

CALIBRATION:

1. Fill empty Tedlar bag with 100 ppm isobutylene gas standard (used to calibrate HNU to 55 ppm). Attach probe to Tedlar bag. Do not connect HNU probe directly to isobutylene tank.

2. Turn the Function Switch to the 0-200 range position and note the meter reading. If meter does not read 55 ppm, use the SPAN Control Knob to set the meter reading at 55 ppm. Lock the SPAN Control Knob.

3. Record identity and concentration of calibration gas and the SPAN Control setting on the Environmental Monitoring Record each time the instrument is calibrated.

4. Re-calibrate the HNU each time the instrument is turned off. Place the instrument on STANDBY when not in active use during the work day.

CAUTION: Check the battery charger frequently throughout the work period--do not allow the needle to fall below the green line when the function switch is on BATT. If needles approach the left range of this green line, stop and recharge the instrument.

Probe must be attached to the readout assembly, with the interlock switch fully depressed, in order to recharge the instrument.

PHOTOVAC MICROTIP

BACKGROUND

The Microtip measures the concentration of airborne ionizable gases and automatically displays and records these concentrations. The Microtip operates automatically, updating the display every 0.5 second. The Microtip automatically records the minimum, maximum, and average concentration for each 15-second period.

The keypad is used to set up and calibrate the Microtip. It has a tutorial function which is activated by pressing the "tutor" key. When "tutor" is pushed, the remaining keys will give a brief explanation of their function when they are pressed. To end the tutorial session, press "exit" twice.

OPERATION

STEP 1 Place battery pack onto Microtip. Battery must be charged for 8 hours prior to use.

STEP 2 Turn on rocker switch located on handle; display will read: "Machine warming up—please wait." When machine is ready it will read "ready" and show day, date, and time.

STEP 3 Now if you care to, you can activate tutor key as mentioned key.

STEP 4 Fill Tedlar bag included with the Microtip with 100 ppm isobutylene span gas.

STEP 5 Press "CAL" button on keypad—instrument will read: "Enter zero gas." At this point, expose the Microtip to clean outdoor air to set zero standard. Press enter and the Microtip will automatically calibrate itself.

STEP 6 The display will now read "Enter span gas concentration." Since we are using 100 ppm isobutylene, set concentration with the #s of the keypad to 100. Attach Tedlar bag of isobutylene and press enter. Machine will automatically calibrate and display will read "ready" with day, date, time, and event # displayed.

STEP 7 Detach Tedlar bag and Microtip is ready to use. The Microtip should be calibrated at least once a day.

The Microtip has a calibration memory that holds up to five different span gas concentrations. However, regardless of the span gas used, the Microtip cannot pick out separate gases but gives the reading of the total ionizable compounds in the air.

A. SETUP KEY

In order to select the range of detection for the Microtip, press the setup key and then select the range 0-20, 0-200, or 0-2000 ppm using the arrow keys. Hit "enter"; next select calibration memory with arrows (using #1 for isobutylene) and press "enter". The Microtip will now display hours, minutes, day, date, etc. If these are correct, continue to press "enter" until "ready display" appears.

B. EVENT KEY

Press event key if you want to mark a specific sample—otherwise, the event is numbered when you turn on the instrument.

C. PLAY

This key is used to recall date. Press play and the * key for options. You can now enter an event # and the machine will display all data for that event.

THINGS TO BE AWARE OF...

If you get a Lo Bat display you should immediately replace the battery as you will have only 10 minutes of charge left. If you continue to run the Microtip, a second message will appear—"Critically low bat". The Microtip will then turn off to prevent deep discharge and memory loss.

This is a delicate instrument. Please be careful with it as it is not as durable as HNUs and OVAs.

This will get you started in the basic operation of the Microtip. If you have any questions or problems, see the owner's manual as it is clearly laid out and easy to understand.

ATTACHMENT G

MATERIAL SAFETY DATA SHEETS

Scott Specialty Gases
ROUTE 611 NORTH, PLUMSTEADVILLE, PA 18949 (215) 766-8861
Electronics Group
2330 HAMILTON BOULEVARD, P.O. BOX 648, SOUTH PLAINFIELD, N.J. 07080 (201) 754-7700

74828

REGIONAL PHONE NUMBERS

PA (215) 766-8861 CA (714) 887-2671 MI (313) 589-2350 TX (713) 844-4820
NJ (201) 754-7700 CA (415) 659-0162 CO (303) 442-4700 MA (617) 245-9702

MATERIAL SAFETY DATA SHEET

SECTION I - MATERIAL IDENTIFICATION

CHEMICAL NAME: Methane

CHEMICAL FORMULA: CH_4

CHEMICAL FAMILY: Hydrocarbon gas

DATE PREPARED: 6/23/89

SUPPLIER: Scott Specialty Gases

ADDRESS: Route 611 Plumsteadville, PA 18949

IN CASE OF EMERGENCY, CONTACT YOUR REGIONAL PLANT MANAGER

OTHER DESIGNATIONS: Methyl hydride, CAS# 74-82-8

SECTION II - HAZARDOUS INGREDIENTS

		EXPOSURE LIMITS (PPM)		
		ACGIH	OSHA	
COMPONENT	CONCENTRATION	TLV	PEL	OTHER
Methane	100%			Simple Asphyxiant

SECTION III - PHYSICAL DATA

BOILING POINT: -161.5F

SPECIFIC GRAVITY (Air = 1): .55

VAPOR PRESSURE @ 20C: N/A

PERCENT, VOLATILE BY VOLUME (%): N/A

VAPOR DENSITY (AIR = 1) @0C 1 atm: 0.555

EVAPORATION RATE (_____ = 1): N/A

SOLUBILITY IN WATER @20C v/v, 1 atm: 0.033

APPEARANCE AND ODOR: Colorless odorless

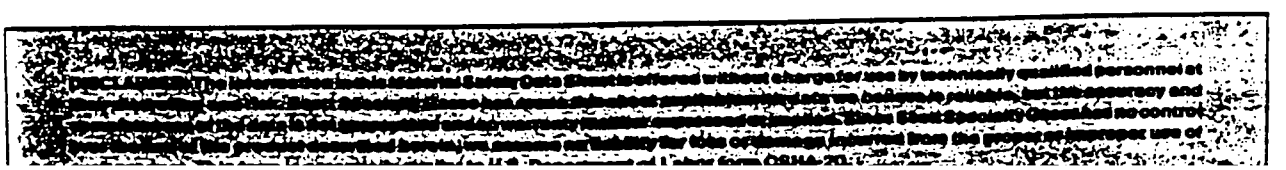
SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT AND METHOD	FLAMMABLE LIMITS	LEL	UEL
-306F	In air at 1 atm	5%	15%

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, halocarbon gas

SPECIAL FIRE FIGHTING PROCEDURES: Stop flow of gas, keep adjacent areas cools. It may be necessary or desirable to allow flame at cylinder or storage tank to continue burning while cooling surroundings with water from a safe distance.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Forms explosive mixtures with air or oxygen. Hazard of reigni or explosion exists if flame is extinguished without stopping low of gas or cooling surroundings. Danger of rocketing cylinders and explosion exists. Methane cylinders have fusible metal safety devices (165F or 212F) for pressure relie



SECTION V - REACTIVITY DATA

STABILITY: Stable under normal storage conditions. Avoid mixture of liquid methane with liquid oxygen.

INCOMPATIBILITY (MATERIALS TO AVOID): Oxidizing agents, BrF_5, Cl_2, ClO_2, NF_3, liquid O_2, OF_2

HAZARDOUS DECOMPOSITION PRODUCTS: None

HAZARDOUS POLYMERIZATION: Will not occur

SECTION VI - HEALTH HAZARD DATA

ROUTES OF ENTRY: Inhalation

EFFECTS OF OVER EXPOSURE (ACUTE): Suffocation, dizziness, headache, nausea, loss of consciousness and death may occur. Contact with liquid methane can cause freeze burns. (CHRONIC): None (MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE): None

CARCINOGENICITY - NTP? NO IARC MONOGRAPHS? NO OSHA REGULATED? NO

EMERGENCY AND FIRST AID: Remove to fresh air. Artificial respiration if required.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN: Evacuate and ventilate area. Shut off methane source if possible. Remove sources of heat o ignition. Painting suspected area with soap solution may be used to detect a leak.

WASTE DISPOSAL METHOD: Remove cylinder to outdoors or ventilated hood. Allow gas to discharge at a slow moderate rate.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE): Use a self-contained breathing apparatus in case of emergency or non-routine use.

VENTILATION: Provide adequate general and local exhaust ventilation

OTHER PROTECTIVE EQUIPMENT: Wear safety goggles, rubber gloves, and safety shoes. A safety shower and eyewash station should be readily available.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Store in well ventilated area away from oxidizers, sources of heat and ignition. No part of the cylinder should be exposed to temperatures above 125F. Keep valve protection cap on cylinders when not in use and secure cylinder when using to protect from falling. Use suitabl hand truck to move cylinders.

OTHER PRECAUTIONS: Protect containers from physical damage. Do not deface cylinders or labels. Move cyli with adequate hand truck. No smoking where methane is used or stored. Methane lines can be tested for leakage w nitrogen pressure before use. Cylinders should be refilled by qualified producers of compressed gases. Shipment of compressed gas cylinder which has not been filled by the owner or with his written consent is a violation of federal la (49 CFR).

III(02,06)

Scott Specialty Gases
ROUTE 611 NORTH, PLUMSTEADVILLE, PA 18949 (215) 766-8861

115117

Electronics Group
2330 HAMILTON BOULEVARD, P.O. BOX 648, SOUTH PLAINFIELD, N.J. 07080 (201) 754-7700

REGIONAL PHONE NUMBERS

PA (215) 766-8861	CA (714) 887-2571	MI (313) 589-2950	TX (713) 644-4820
NJ (201) 754-7700	CA (415) 659-0162	CO (303) 442-4700	MA (617) 245-8707

MATERIAL SAFETY DATA SHEET

SECTION I - MATERIAL IDENTIFICATION

CHEMICAL NAME: Isobutylene

CHEMICAL FORMULA: $(CH_3)_2CCH_2$

CHEMICAL FAMILY: Hydrocarbon gas

DATE PREPARED: 9/14/89

SUPPLIER: Scott Specialty Gases

ADDRESS: Route 611 Plumsteadville, PA 18949

In Case of Emergency, Contact your Regional Plant Manager

OTHER DESIGNATIONS: Isobutene or 2-methylpropene.
CAS# 115-11-7

SECTION II - HAZARDOUS INGREDIENTS

		EXPOSURE LIMITS (PPM)		
		ACGIH	OSHA	
COMPONENT	CONCENTRATION	TLV	PEL	OTHER
Isobutylene	100%		None Established	

SECTION III - PHYSICAL DATA

BOILING POINT (°F): 19.6

SPECIFIC GRAVITY (H_2O = 1) @ 25°C Sat. Press.: 0.588

VAPOR PRESSURE @ 21.1°C (atm): 2.65

PERCENT, VOLATILE BY VOLUME (%): 100

VAPOR DENSITY (AIR = 1) @25°C
1 atm: 1.947

EVAPORATION RATE (_____ = 1): N/A

SOLUBILITY IN WATER: Slight

APPEARANCE AND ODOR: Colorless, ethereal odor

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT AND METHOD	FLAMMABLE LIMITS	LEL	UEL
-105°F	Vol. %	1.8%	9.6%

EXTINGUISHING MEDIA: Do not extinguish burning gas if flow cannot be shut off. Use water spray to keep fire exposed cylinders cool. Move cylinder away from fire if there is no risk.

SPECIAL FIRE FIGHTING PROCEDURES: Wear self-contained breathing apparatus and full protective clothing. Flammable high pressure liquid or gas.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Dangerous. Vapor may travel considerable distance to source of ignition and flash back. May form explosive mixtures with air. Can react vigorously with oxidizing materials.

DISCLAIMER: The information in this Material Safety Data Sheet is offered without charge for use by technically qualified personnel at their discretion and risk. Scott Specialty Gases has made this sheet available with data we believe is reliable, but the accuracy and completeness of the data is not guaranteed and no warranty is either expressed or implied. Since Scott Specialty Gases has no control over the use of the product described herein, we assume no liability for loss or damage incurred from the proper or improper use of such product. This form is essentially similar to U.S. Department of Labor form OSHA-20.

SECTION V - REACTIVITY DATA

STABILITY: Stable under normal storage conditions

INCOMPATIBILITY (MATERIALS TO AVOID): Oxidizing materials

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide

HAZARDOUS POLYMERIZATION: Will not occur

SECTION VI - HEALTH HAZARD DATA

ROUTES OF ENTRY: Inhalation

EFFECTS OF OVER EXPOSURE (ACUTE): Asphyxiant. Symptoms include rapid respiration, muscular incoordination, fatigue, nausea, and vomiting. Loss of consciousness and death may occur. Contact with liquid may result in symptoms of frostbite. (CHRONIC):. None (MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE): None

CARCINOGENICITY - NTP? NO IARC MONOGRAPHS? NO OSHA REGULATED? NO

EMERGENCY AND FIRST AID: Inhalation - Immediately remove victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. Skin/Eye contact - Immediately flush with copious amounts of water for at least 15 minutes while removing contaminated clothing. If frostbite occurs, warm effected area with water or towel.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN: Evacuate and ventilate area. Remove leaking cylinder to exhaust hood or safe outdoors area if this can be done safely.

WASTE DISPOSAL METHOD: Return cylinders to supplier for proper disposal with any valve outlet plugs or caps secured and valve protection cap in place. Do not reuse cylinder. Empty cylinder will contain hazardous residue.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE): Use a self-contained breathing apparatus in case of emergency or non-routine use.

VENTILATION: Provide adequate and local exhaust ventilation to maintain concentration below exposure limits.

OTHER PROTECTIVE EQUIPMENT: Protective gloves are recommended, safety goggles, safety shoes when handling cylinders.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Store in well ventilated above-ground area away from heat and ignition sources and oxidizing materials. Keep valve protection cap on cylinders when not in use and secure cylinder when using to protect from falling. Use suitable hand truck to move cylinders.

OTHER PRECAUTIONS: Protect containers from physical damage. Do not deface cylinders or labels. Move cylinder with adequate hand truck. Cylinders should be refilled by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his written consent is a violation of federal law (49 CFR).

II(07)IV-V(01)VI(01,04)VII-IX(01)

J. T. Baker Chemical Co.
222 Red School Lane Phillipsburg, N.J. 08865
24-Hour Emergency Telephone - (201) 859-2151
Chemtrec # (800) 424-9300
National Response Center # (800) 424-8802

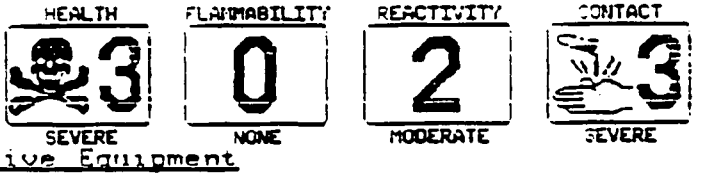
MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT IDENTIFICATION

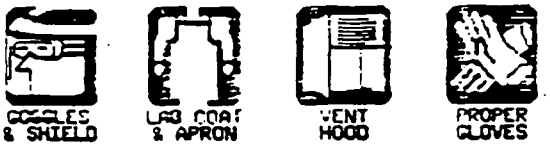
Product Name: Hydrochloric Acid, 1N
Formula: HCl in H_2O
Formula Wt: 36.46
CAS No.: 07647-01-0
Product Codes: 5620

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA™ System



Laboratory Protective Equipment



Precautionary Label Statements

POISON! DANGER!
MAY BE FATAL IF SWALLOWED
CAUSES BURNS

Do not get in eyes, on skin, on clothing.
Do not breathe vapor. Keep in tightly closed container. Use with adequate ventilation. Wash thoroughly after handling.

SECTION II - HAZARDOUS COMPONENTS

Component	%	CAS No.
Hydrogen Chloride	3-4	7647-01-

SECTION III - PHYSICAL DATA

Boiling Point:	N/A	Vapor Pressure(mmHg):	N/A
Melting Point:	N/A	Vapor Density(air=1):	1.3
Specific Gravity: (H_2O=1)	1.19	Evaporation Rate: (Butyl Acetate=1)	N/A

Continued on Page: 2

SECTION III - PHYSICAL DATA (Continued)

Solubility(H_2O): Complete (in all proportions) % Volatiles by Volume: 100

Appearance & Odor: Colorless liquid with hydrogen chloride odor.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A NFPA 704M Rating: 3-0-0

Fire Extinguishing Media
Use extinguishing media appropriate for surrounding fire.

Special Fire-Fighting Procedures
Firefighters should wear proper protective equipment and self-contained (positive pressure if available) breathing apparatus with full facepiece.
Move exposed containers from fire area, if it can be done without risk.
Use water to keep fire exposed containers cool; do not get water inside containers.

Unusual Fire & Explosion Hazards
Closed containers exposed to heat may explode.

Toxic Gases Produced
hydrogen chloride

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 7 mg/m^3 (5 ppm)

Effects of Overexposure
Contact with skin or eyes may cause severe irritation or burns.
Inhalation of vapors may cause coughing, chest pains, or nose and throat irritation.
Ingestion may cause severe burning to mouth and stomach.

Emergency and First Aid Procedures
If swallowed, do NOT induce vomiting; if conscious, give water, milk, or milk of magnesia.
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Wash clothing before re-use.

SECTION VI - REACTIVITY DATA

ability: Stable Hazardous Polymerization: Will not occur

Incompatibles: most common metals, strong bases, metal oxides, amines,

Continued on Page: 3

SECTION VI - REACTIVITY DATA (Continued)

carbonates

Decomposition Products: hydrogen chloride

SECTION VII - SPILL AND DISPOSAL PROCEDURES

Steps to be taken in the event of a spill or discharge

Wear self-contained breathing apparatus and full protective clothing. St leak if you can do so without risk. Ventilate area. Neutralize spill wi soda ash or lime. With clean shovel, carefully place material into clean dry container and cover; remove from area. Flush spill area with water.

J. T. Baker Neutrasorb[R] or Neutrasol[R] "Low Na+" acid neutralizers are recommended for spills of this product.

Disposal Procedure

Dispose in accordance with all applicable federal, state, and local environmental regulations.

EPA Hazardous Waste Number: D002 (Corrosive Waste)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

Ventilation:	Use general or local exhaust ventilation to meet TLV requirements.
Respiratory Protection:	Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 100 ppm, a chemical cartridge respirator with acid cartridge is recommended. Above this level, a self-contained breathing apparatus is advised.
Eye/Skin Protection:	Safety goggles and face shield, uniform, protective suit, acid-resistant gloves are recommended.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA[TM] Storage Color Code: White

Special Precautions

Keep container tightly closed. Store in corrosion-proof area.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

Proper Shipping Name Hydrochloric acid

Continued on Page: 4

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION (Continued)

Hazard Class	Corrosive material (liquid)
JN/NA	UN1789
Labels	CORROSIVE
Reportable Quantity	5000 LBS.

INTERNATIONAL (I.M.O.)

Proper Shipping Name	Hydrochloric acid, solution
Hazard Class	8
JN/NA	UN1789
Labels	CORROSIVE

N/A = Not Applicable or Not Available

The information published in this Material Safety Data Sheet has been compiled rom our experience and data presented in various technical publications. It is he user's responsibility to determine the suitability of this information for the adoption of necessary safety precautions. We reserve the right to revise Material Safety Data Sheets periodically as new information becomes available.

Material Safety Data Sheet
May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List): ALCONOX

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name: ALCONOX, INC.	Emergency Telephone Number: (212) 473-1300
Address (Number, Street, City, State, and ZIP Code): 215 PARK AVENUE SOUTH	Telephone Number for Information: (212) 473-1300
NEW YORK, N.Y. 10003	Date Prepared: FEB.1, 1991
	Signature of Preparer (optional):

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
THERE ARE NO INGREDIENTS IN ALCONOX WHICH APPEARED ON THE OSHA STANDARD 29 CFR 1910 SUBPART Z.				

Section III — Physical/Chemical Characteristics

Boiling Point	N.A.	Specific Gravity (H_2O = 1)	N.A.
Vapor Pressure (mm Hg.)	N.A.	Melting Point	N.A.
Vapor Density (AIR = 1)	N.A.	Evaporation Rate (Butyl Acetate = 1)	N.A.

Solubility in Water: APPRECIABLE (GREATER THAN 10 PER CENT)

Appearance and Odor: WHITE POWDER INTERSPERED WITH CREAM COLORED FLAKES - ODORLESS

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
NONE		N.A.	N.A.

Extinguishing Media: WATER, CO_2, DRY CHEMICAL, FOAM, SAND/EARTH

Special Fire Fighting Procedures: FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER WITHOUT PROTECTIVE EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS.

Unusual Fire and Explosion Hazards: NONE

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid: NONE
	Stable	XX	

Incompatibility (*Materials to Avoid*): AVOID STRONG ACIDS

Hazardous Decomposition or Byproducts: MAY RELEASE CO, GAS ON BURNING

Hazardous Polymerization	May Occur		Conditions to Avoid: NONE
	Will Not Occur	XX	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? YES Skin? NO Ingestion? YES

Health Hazards (*Acute and Chronic*): INHALATION OF POWDER MAY PROVE LOCALLY IRRITATING TO MUCOUS MEMBRANES. INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.

Carcinogenicity: NTP? NO IARC Monographs? NO OSHA Regulated? NO

Signs and Symptoms of Exposure: EXPOSURE MAY IRRITATE MUCOUS MEMBRANES. MAY CAUSE SNEEZING.

Medical Conditions Generally Aggravated by Exposure: RESPIRATORY CONDITIONS MAY BE AGGRAVATED BY POWDER.

Emergency and First Aid Procedures: EYES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES SKIN-FLUSH WITH PLENTY OF WATER INGESTION-DRINK LARGE QUANTITIES OF WATER, GET MEDICAL ATTENTION FOR DISCOMFORT

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled: MATERIAL FOAMS PROFUSELY. SHOVEL AND RECOVER AS MUCH AS POSSIBLE. RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADABLE.

Waste Disposal Method: SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF ACCORDING TO LOCAL REQUIREMENTS FOR NON-HAZARDOUS DETERGENT.

Precautions to Be Taken in Handling and Storing: STORE IN A DRY AREA TO PREVENT CAKING.

Other Precautions: NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.

Section VIII — Control Measures

Respiratory Protection (*Specify Type*): DUST MASK

Ventilation	Local Exhaust: NORMAL	Special: N.A.	
	Mechanical (General): N.A.	Other: N.A.	

Protective Gloves: USEFUL-NOT REQUIRED Eye Protection: USEFUL-NOT REQUIRED

Other Protective Clothing or Equipment: NOT REQUIRED

Work/Hygienic Practices: NO SPECIAL PRACTICES REQUIRED

• USGPO 1988-491-529/45775

Baxter Healthcare Corporation
Burdick & Jackson Division
1953 South Harvey Street
Muskegon, MI 49442 USA

information/emergency telephone no 616.726.3171
chemtrec telephone no. 800.424.9300
canadian emergency telephone no. 613.996.6666

MATERIAL SAFETY DATA SHEET

METHANOL

I. Identification

chemical name Methanol — molecular weight 32.04
chemical family Alcohol — formula CH_4O
synonyms Carbinol, Methyl Alcohol, Wood Alcohol
DOT proper shipping name Methyl Alcohol or Methanol
DOT hazard class Flammable Liquid
DOT identification no. UN1230 — CAS no. 67-56-1

II. Physical and Chemical Data

boiling point, 760mm Hg. 64.7°C — freezing point -97.7°C — evaporation rate (BuAc=1) ca 5
vapor pressure at 20°C 97 mm Hg — vapor density (air=1) 1.11 — solubility in water @ 20°C complete
% volatiles by volume ca 100 — specific gravity (H₂O=1) @ 20°C 0.792 — stability Stable
hazardous polymerization Not expected to occur.
appearance and odor A clear, colorless liquid with a slight alcoholic odor.
conditions to avoid Heat, sparks, open flame, open containers, and poor ventilation.

materials to avoid Strong oxidizing agents and reactive metals which will displace hydrogen.

hazardous decomposition products Incomplete combustion can generate carbon monoxide and other toxic vapors such as formaldehyde.

III. Fire and Explosion Hazard Data

flash point, (test method) 12°C (Tag closed cup) — auto ignition temperature 385°C
flammable limits in air % by volume: lower limit 6.7 — upper limit 36.5
unusual fire and explosion hazards May burn with an invisible flame. Mixtures with water as low as 21% by volume are still flammable (flash point below 37.8°C). Under some circumstances can corrode certain metals, including aluminum and zinc, and generate hydrogen gas.
extinguishing media Carbon dioxide, dry chemical, alcohol foam, water mist or fog.
special fire fighting procedures Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure and may rupture closed storage containers. Keep fire-exposed containers cool with water spray.

IV. Hazardous Components

	%	TLV	CAS no.
Methanol	ca 100	200 ppm (skin)	67-56-1

Burdick & Jackson's Disclaimer: The information and recommendations presented in this Material Safety Data Sheet are based on sources believed to be reliable on the date hereof. Burdick & Jackson makes no representation on its completeness or accuracy. It is the user's responsibility to determine the product's suitability for its intended use, the product's safe use, and the product's proper disposal. No representations or warranties, either express or implied, of merchantability or fitness for a particular purpose or of any other nature are made with respect to the information provided in this Material Safety Data Sheet or to the product to which such information refers. Burdick & Jackson neither assumes nor authorizes any other person to assume for it, any other or additional liability or responsibility resulting from the use of, or reliance upon, this information.

Emergency First Aid

Inhalation: Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact: Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact: Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion: Call local Poison Control Center for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

Note to Physician

In case of ingestion or massive inhalation, observe victim as an inpatient because slow metabolism causes a latent period of 24 hours between exposure and acidosis and blindness.

VI. Safety Measures and Equipment

Ventilation: Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory: Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes: Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin: Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene, nitrile rubber, or rubber offer acceptable chemical resistance. Individuals who are acutely and specifically sensitive to methanol may require additional protective equipment.

V. Health Hazards

Occupational Exposure Limits

OSHA	TWA	- 200 ppm
	STEL	- 250 ppm
	Ceiling	- not listed
ACGIH	TLV-TWA	- 200 ppm
	TLV-STEL	- 250 ppm
NIOSH	10 hour TWA	- 200 ppm
	15 min Ceiling	- 800 ppm

Concentration Immediately Dangerous to Health

OSHA/NIOSH	25,000 ppm

Odor Threshold

NSC	10 ppm
NIOSH	2000 ppm

Carcinogenic Data

Methanol is not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Primary Routes of Entry

Methanol may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

Inhalation: Exposure can cause drowsiness and intoxication, headache, visual disturbance leading to blindness, coughing and shortness of breath, collapse and death at high concentrations.

Eye Contact: Liquid can cause moderate burning, watering, swelling, and redness; high vapor concentration (greater than 2000 ppm) may cause same symptoms.

Skin Contact: This substance may be absorbed through intact skin and produce toxic effects. Extensive, repeated and/or prolonged skin contact can cause burning, itching, redness, or blisters.

Ingestion: Causes burning of the gastrointestinal tract and toxic effects. Swallowing more than 2 ounces of methanol can cause death.

Effects of Overexposure

Mild poisoning is characterized by fatigue, nausea, headache, and delayed visual blurring. Moderate intoxication results in severe depression. Temporary or permanent blindness may follow in 2-6 days. In severe poisoning, symptoms progress to rapid, shallow respiration, cyanosis, coma, hypotension, dilated pupils, and visual disturbance. Death may result from respiratory failure.

Medical Condition Aggravated by Exposure

Preclude from exposure those individuals with diseases of eyes, liver, kidneys, and lungs.

Storage: Methanol should be protected from temperature extremes and direct sunlight. Proper storage of methanol must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, methanol should be stored in an acceptably protected and secure flammable liquid storage room.

Other: Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

VII. Spill and Disposal Data

Spill Control: Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements.
CERCLA Reportable Quantity — 5,000 lbs.

Waste Disposal: Dispose of methanol as an EPA hazardous waste. Contact state environmental agency for listing of licensed hazardous waste disposal facilities and applicable regulations. Hazardous waste numbers: U154(Ignitable); D001(Ignitable).

VIII. SARA/Title III Data

Hazard Classification	
Immediate Health	Yes
Delayed Health	Yes
Fire	Yes
Sudden Release	No
Reactive	No

Chemical Listings	
Extremely Hazardous Substances	No
CERCLA Hazardous Substances	Yes
Toxic Chemicals	Yes

Methanol is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372. This product does not contain any other toxic chemical above 1% concentration or a carcinogen above 0.1% concentration.

Revision Date: July, 1989

KEY

ca	Approximately
na	Not applicable
C	Ceiling
STEL	Short Term Exposure Level (15 minutes)
TLV	Threshold Limit Value
TWA	Time Weighted Average (8 hours)
BuAc	Butyl Acetate

CERCLA Comprehensive Environmental Response, Compensation and Liability Act
NSC National Safety Council ("Fundamentals of Industrial Hygiene," 3rd Ed., 1988)

MALLINCKRODT

Material Safety Data Sheet

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Mallinckrodt, Inc. Science Products Division, P.O. Box M Paris, KY 40361

Emergency Telephone Number: 314-982-5000

NITRIC ACID, 70%

PRODUCT IDENTIFICATION:

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 70%

Formula CAS No.: 7697-37-2

Molecular Weight: 63.00

Chemical Formula: HNO_3

Hazardous Ingredients: Nitric acid

PRECAUTIONARY MEASURES

DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

Do not get in eyes, on skin, or on clothing.
Avoid breathing mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
This substance is classified as a POISON under the Federal Caustic Poison Act.

EMERGENCY/FIRST AID

In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. If swallowed, DO NOT INDUCE VOMITING!
Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Oxidizer

SECTION 1 Physical Data

Appearance: Clear, colorless to slightly yellow liquid.

Odor: Suffocating acrid.

Solubility: Infinite in water.

Boiling Point: 122°C (252°F)

Melting Point: -34°C (-29°F)

Specific Gravity: 1.41

Vapor Density (Air = 1): 2-3 approximately

Vapor Pressure (mm Hg): 62 @ 20°C (68°F)

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc.

Fire Extinguishing Media:
If involved in a fire, use water spray.

Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.

SECTION 4 Leak/Spill Disposal Information

Isolate or enclose the area of the leak or spill. Clean-up personnel should wear protective clothing and respiratory equipment suitable for toxic or corrosive fluids or vapors.
Small Spills: Flush with water and neutralize with alkaline material (soda ash, lime, etc.). Sewer with excess water.
Larger spills and lot sizes: Neutralize with alkaline material, pick up with absorbent material (sand, earth, vermiculite) and dispose in a RCRA-approved waste facility or sewer the neutralized slurry with excess water if local ordinances allow. Provide forced ventilatibn to dissipate fumes.

Reportable Quantity (RQ)(CWA/CERCLA) : 1000 lbs.

Ensure compliance with local, state and federal regulations.

AD

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0 Other: Oxidizer

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.

Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.

Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.

Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Splashes may cause severe burns and permanent eye damage.

Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggrevation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

B. FIRST AID

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Exposure:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Exposure:
Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY DATA (RTECS, 1986)

Inhalation (Rat) LC50: 244 ppm
(NO_2)/30M

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommende Practices", most recent edition, for details.

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and cannisters that contain oxidizable materials, such as activated charcoal.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

SECTION 7 Storage and Special Information

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Protect from moisture.

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Material Safety Data Sheet

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Mallinckrodt, Inc. Science Products Division, P.O. Box M Paris, KY 40361

Emergency Telephone Number: 314-982-5000

Addendum to Material Safety Data Sheet

REGULATORY STATUS

This Addendum Must Not Be Detached from the MSDS

Identifies SARA 313 substance(s)

Any copying or redistribution of the MSDS must include a copy of this addendum

(Chem.Key: NITRA)

Hazard Categories for SARA Section 311/312 Reporting

Acute	Chronic	Fire	Pressure	Reactive
X	X			X

Product or Components of Product:	SARA EHS Sect. 302 RQ (lbs.)	SARA EHS Sect. 302 TPQ (lbs.)	SARA Section 313 Chemicals Name List	SARA Section 313 Chemicals Chemical Category	CERCLA Sec.103 RQ (lbs.)	RCRA Sec. 261.33
NITRIC ACID, 70% (7697-37-2)	1000	1,000	Yes	No	1000	No

SARA Section 302 EHS RQ: Reportable Quantity of Extremely Hazardous Substance, listed at 40 CFR 355.
SARA Section 302 EHS TPQ: Threshold Planning Quantity of Extremely Hazardous Substance. An asterisk (*) following a Threshold Planning Quantity signifies that if the material is a solid and has a particle size equal to or larger than 100 micrometers, the Threshold Planning Quantity = 10,000 LBS.
SARA Section 313 Chemicals: Toxic Substances subject to annual release reporting requirements listed at 40 CFR 372.65.
CERCLA Sec. 103: Comprehensive Enviromental Response, Compensation and Liability Act (Superfund). Releases to air, land or water of these hazardous substances which exceed the Reportable Quantity (RQ) must be reported to the National Response Center, (800-424-8802); Listed at 40 CFR 302.4
RCRA: Resource Conservation and Reclamation Act. Commercial chemical product wastes designated as acute hazards and toxic under 40 CFR 261.33

RICCA CHEMICAL COMPANY
P.O. BOX 13090
ARLINGTON, TEXAS 76013
Information/Emergency Telephone
(817) 461-5601

MATERIAL SAFETY DATA SHEET

(for compliance with 29CFR 1910.1200, OSHA Hazard Communication Standard)

PRODUCT IDENTITY	RICCA CHEMICAL COMPANY CATALOG NUMBER(S)
SULFURIC ACID, 5% (v/v) Thru 89% (w/w) and 0.25 Thru 10 Normal	8149 Thru 8195 and 8270 Thru 8340

Date Prepared/Revised	2-19-90	Information furnished applies to all sizes. N/A = Not Applicable N/D = Not Determined

HAZARDOUS INGREDIENTS/IDENTITY INFORMATION SECTION I

Hazardous Components (CAS No.)	Concentration in Product	OSHA PEL	ACGIH TLV
Sulfuric Acid (7664-93-9)	7 ml.-900 ml./l.	1mg/M^3	1mg/M^3
Water (7732-18-5)	Approx. 100ml.-995ml./l.	N/A	N/A

Remainder of composition is either water or other non-hazardous substance(s) and/or hazardous ingredient(s) below reportable hazardous level(s).

PHYSICAL AND CHEMICAL DATA SECTION II

Melting Point, °C. Below 0
Boiling Point, °C., approx. 100-150
Specific Gravity, approx. 1.06-1.80
Solubility in Water Infinite
Description: Clear, colorless, odorless liquid.

FIRE AND EXPLOSION HAZARD DATA SECTION III

Flash Point, °C., approx. N/A

Extinguishing Media

N/A

Special Fire Fighting Procedures

N/A

Unusual Fire and/or Explosion Hazards

N/A

REACTIVITY DATA SECTION IV

Conditions and/or Materials to Avoid: Stable under normal conditions of use and storage.
Avoid: Organics, Chlorates, Carbides, Fulminates, Picrates, Metals.

Hazardous Decomposition or Byproducts: Hazardous polymerization will not occur.

8149A

HEALTH HAZARD DATA — SECTION V

Route(s) of Entry: Inhalation Yes — Skin Yes — Ingestion Yes

Carcinogenicity: NTP No — IARC Monographs No — OSHA Regulated No

Health Hazards

Hazards increase as concentration increases.
Sulfuric Acid Solutions are corrosive.
Target Organs are: Respiratory system, eyes, skin, teeth.
LD 50, Oral, Rat(H_2SO_4): 2140mg/kg.

Signs and Symptoms of Exposure

Irritation of eyes, nose, throat. Pulmonary Edema, Bronchial Emphysema, dental erosion. Burns of skin and eyes.

Medical Conditions Generally Aggravated by Exposure

Chronic Respiratory Disease. Pre-existing Eye Problems. Pre-existing Skin Disorders.

Emergency and First Aid Procedures In all cases seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantities of running water.
SKIN CONTACT: Water flush immediately. Remove any contaminated clothing.
INHALATION: Remove to fresh air. Give artificial respiration if necessary.
INGESTION: Dilute immediately with water or milk. Do not induce vomiting. Get Medical Help.

PRECAUTIONS FOR SAFE HANDLING AND USE — SECTION VI

Steps to Be Taken in Case Material is Released or Spilled

Cover the contaminated surface with Sodium Bicarbonate or a soda ash-slaked lime mixture (50-50). Mix and add water if necessary to form slurry. Scoop up slurry and wash down with excess of water. Wash site with soda ash solution.

Waste Disposal Method

Add slowly to agitated solution of soda ash and slaked lime. Flush neutralized solution to drain with excess of water.

Precautions to Be Taken in Handling and Storing

Store away from incompatible materials.

CONTROL MEASURES — SECTION VII

Ventilation/Respiratory Protection: Normal room ventilation is adequate.

Eye Protection: Safety glasses with side shields, or goggles.

Protective Gloves: Rubber.

Other Protective Clothing or Equipment: Lab Coat or Lab Apron.

Work/Hygienic Practices Wash hands after handling this or any other chemical before eating, drinking or smoking.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard, mainly because of the relatively low volumes of this product that will be dispensed or used at a time. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

8149B

ATTACHMENT H

SITE ENTRY AND EXIT LOG

Site Name: Allen Harbor Landfill, NCBC-Davisville, Rhode Island CTO No.: 0003
Project No.: 29600.03 Task No.: 4100

Date	Name	Representing	Time In	Time Out

ATTACHMENT I

ACCIDENT INVESTIGATION REPORT

ACCIDENT INVESTIGATION REPORT

CASE NUMBER

COMPANY _____ ADDRESS _____

DEPARTMENT _____ LOCATION (if different from mailing address) _____

1. NAME of INJURED

2. SOCIAL SECURITY NUMBER

3. SEX ☐ M ☐ F

4. AGE

5. DATE of ACCIDENT

6. HOME ADDRESS

7. EMPLOYEE'S USUAL OCCUPATION

8. OCCUPATION at TIME of ACCIDENT

9. LENGTH of EMPLOYMENT
☐ Less than 1 mo. ☐ 6 mos. to 5 yrs.
☐ 1-5 mos. ☐ More than 5 yrs.

10. TIME in OCCUP. at TIME of ACCIDENT
☐ Less than 1 mo. ☐ 6 mos. to 5 yrs.
☐ 1-5 mos. ☐ More than 5 yrs.

11. EMPLOYMENT CATEGORY
☐ Regular, full-time ☐ Temporary ☐ Nonemployee
☐ Regular, part-time ☐ Seasonal

12. CASE NUMBERS and NAMES of OTHERS INJURED in SAME ACCIDENT

13. NATURE of INJURY and PART of BODY

14. NAME and ADDRESS of PHYSICIAN

15. NAME and ADDRESS of HOSPITAL

16. TIME of INJURY
A. _____ A.M. P.M.
B. Time within shift
C. Type of shift

17. SEVERITY of INJURY
☐ Fatality
☐ Lost workdays—days away from work
☐ Lost workdays—days of restricted activity
☐ Medical treatment
☐ First aid
☐ Other, specify _____

18. SPECIFIC LOCATION of ACCIDENT

ON EMPLOYER'S PREMISES? ☐ Yes ☐ No

19. PHASE OF EMPLOYEE'S WORKDAY at TIME of INJURY
☐ During rest period ☐ Entering or leaving plant
☐ During meal period ☐ Performing work duties
☐ Working overtime ☐ Other _____

20. DESCRIBE HOW the ACCIDENT OCCURRED

21. ACCIDENT SEQUENCE. Describe in reverse order of occurrence events preceding the injury and accident. Starting with the injury and moving backward in time, reconstruct the sequence of events that led to the injury.

A. Injury Event _____

B. Accident Event _____

C. Preceding Event #1 _____

D. Preceding Event #2, #3, etc. _____

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22. TASK and ACTIVITY at TIME of ACCIDENT

A. General type of task _____

B. Specific activity _____

C. Employee was working:

☐ Alone ☐ With crew or fellow worker ☐ Other, specify _____

23. POSTURE of EMPLOYEE

_____

24. SUPERVISION at TIME of ACCIDENT

☐ Directly supervised ☐ Not supervised

☐ Indirectly supervised ☐ Supervision not required

25. CAUSAL FACTORS. Events and conditions that contributed to the accident. Include those identified by use of the Guide for Identifying Causal Factors and Corrective Actions.

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26. CORRECTIVE ACTIONS. Those that have been, or will be, taken to prevent recurrence. Include those identified by use of the Guide for Identifying Causal Factors and Corrective Actions.

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PREPARED BY _____

TITLE _____

DEPARTMENT _____ DATE _____

APPROVED _____

TITLE _____ DATE _____

APPROVED _____

TITLE _____ DATE _____

ATTACHMENT J

DECONTAMINATION PROTOCOL

DECONTAMINATION PROTOCOL

The decontamination area shall be established in an area of the site considered free from contamination. Equipment and personnel decontamination activities shall be centralized in this area. Decontamination water shall be collected in plastic containers. The decontamination water shall be allowed to evaporate from the containers. At project completion, any remaining water that has not evaporated shall be disposed of in an environmentally safe manner. Methanol rinsate shall be segregated from water rinsate and allowed to evaporate. Prior to arrival onsite, all equipment shall be steam cleaned. Equipment used for excavation and sampling shall be decontaminated prior to use in accordance with the following cleaning procedures:

- The drill rig and all support equipment shall be free from excess grease, oils, and caked-on soils from previous work prior to arrival at the site. Equipment which leaks fuel, coolant, and lubricants shall be removed from the site and repaired prior to use.

- Equipment or materials not used immediately after decontamination shall be placed on a plastic sheet, covered with plastic, and secured to avoid potential contamination.

- Clean with tap water and phosphate-free laboratory detergent, (Liquinox or equivalent) using a brush if necessary to remove particular matter and surface films.

- Rinse thoroughly with potable water.

- Rinse with pesticide-grade methanol (or isopropanol*) and allow to air dry for a minimum of ten (10) minutes. *Based on State requirements.

- Rinse three times with potable water.

- Rinse thoroughly with deionized water and allow to air dry.

- Wrap sampling equipment completely with aluminum foil, shiny side out, to prevent contamination if equipment is to be stored or transported.

- Equipment such as pumps, flow lines, etc. shall be flushed thoroughly with potable water.

Clean, disposable gloves shall be worn while handling sampling equipment during the final stages of decontamination. Pesticide grade methanol and deionized water shall be stored in glass or Teflon containers and applied via Teflon squeeze bottles.

APPENDIX C

SCOPES OF WORK FOR MICROFILTRATION TREATABILITY STUDY AND UV OXIDATION TREATABILITY STUDY

REMEDIATION OF ALLEN HARBOR LANDFILL
NCBC-DAVISVILLE, RHODE ISLAND

MICROFILTRATION TREATABILITY STUDY
SCOPE OF WORK

1. The subcontractor will provide EA Engineering, Science, and Technology (EA) with microfiltration treatability study services for removal of inorganics from groundwater as stated in this scope of work. This subcontract will be on fixed price basis.

2. The treatability test is scheduled to begin in late October 1993. The subcontractor shall perform all services and submit all deliverables as stated herein within 60 days of receipt of the ground water sample.

3. EA will supply the subcontractor with an adequate quantity of ground water on which the test will be conducted. The subcontractor will notify EA of the quantity of ground water required, and shipping procedure, for the treatability study.

4. The treatability study shall evaluate the effectiveness of microfiltration in removing inorganics from the ground water sample. The subcontractor shall determine through various testing membranes and apparatus, the optimal filter membrane, flow rate, backwash frequency, and extent of inorganics removal.

5. For each run of the treatability study, the treated effluent shall be analyzed for Target Analyte List (TAL) metals and cyanide by EPA CLP methods; one sample of the untreated water will also be analyzed as described above. All analytical work shall have a standard turnaround time.

6. The subcontractor shall analyze a sample of dewatered sludge (if any) for the full range of TCLP analytes. The intent here is to determine if any resultant sludge can be disposed of in a landfill, or if more stringent disposal requirements can be anticipated.

7. The subcontractor shall prepare and submit a report to EA documenting, at a minimum, study objectives and approach, testing equipment and procedures, study events, the results of the study, all analytical chemistry results, and conclusions and recommendations. The report shall include a description of scale-up computations to a full scale treatment system capable of 40 gallons per minute, and will also include projected system economics, to include capital and operating costs. A 15 year system life should be assumed. Four copies of the report shall be submitted to EA.

REMEDIATION OF ALLEN HARBOR LANDFILL
NCBC-DAVISVILLE, RHODE ISLAND

ULTRAVIOLET (UV) OXIDATION TREATABILITY STUDY
SCOPE OF WORK

1. The subcontractor will provide EA Engineering, Science, and Technology (EA) with UV oxidation treatability study services as described in this Scope of Work. This subcontract will be on a fixed price basis.

2. The required testing shall be initiated in late October 1993. The subcontractor shall perform all services and submit all deliverables as stated herein within 60 days of receipt of the groundwater sample.

3. EA will supply the subcontractor with an adequate volume of ground water on which the treatability study will be conducted. The subcontractor shall specify the required volume of water, and the containment and shipping procedure prior to initiation of EA's field activities.

4. The treatability study shall evaluate the effectiveness of UV oxidation in removing organics from the water sample. The subcontractor shall determine, through various test arrangements, pretreatment requirements (if applicable), the appropriate oxidizing agent, oxidant usage, power requirement and usage, time of exposure, and extent of degradation achievable. The target treatment standard for the test is mg/l of all VOCs detected in the influent.

5. Analytical chemistry work on the untreated influent and treated effluent shall be analyzed for VOCs by Method 601/602. Analytical work shall have a standard turnaround time.

6. For bidding purposes assume that inorganic treatment will be required prior to the UV oxidation treatability test procedures.

7. The subcontractor shall prepare and submit a report to EA documenting, at a minimum, study objectives and approach, testing equipment and procedures, all UV oxidation study events, the results of the study, all analytical chemistry results, and conclusions and recommendations. A figure showing the components of the UV oxidation process shall also be included. The report shall include a description of scale-up computations to a full scale treatment system to treat 40 gallons per minute of ground water and shall also include projected system economics, to include capital and operating costs. A 15 year system life should be assumed. Four copies of this report shall be submitted to EA.